WATER & SEWAGE WORKS

Easy to Operate
CHAPMAN CONE VALVE

With SIX Features that Give Top Performance

1. No obstruction to flow . . . waterway of valve is same diameter as pipe.
2. Plug is fully seated, open or closed . . . all seats are fully protected.
3. Valve is self-cleaning . . . no chance of fouling.
4. Automatic control or hand operation unwedges, rotates, and rewedges the plug.
5. Positive, easy closing prevents surging and wear on seats.
6. Valve is dependable for either regular or emergency service.

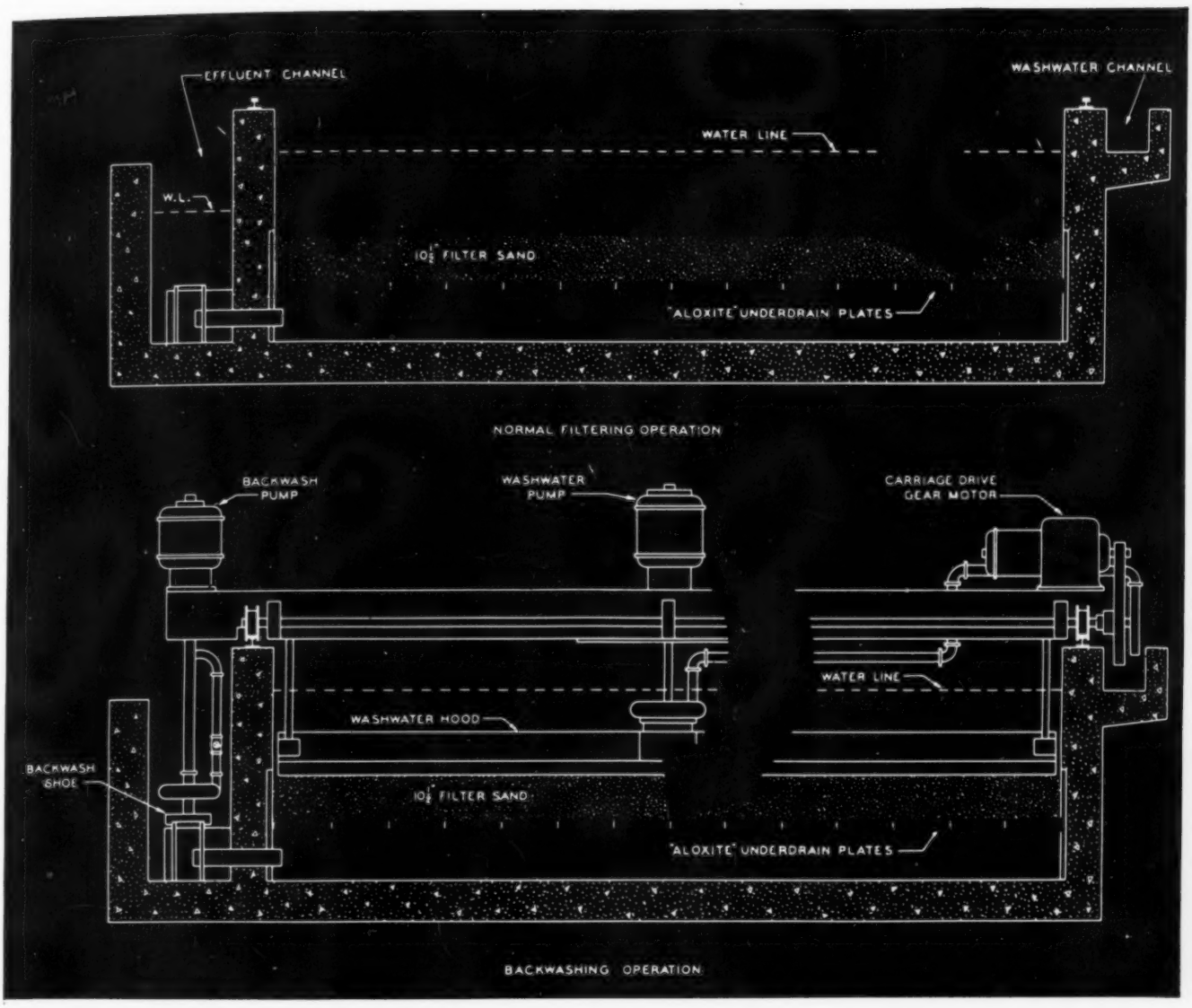
This extra-rugged, plug-type Cone Valve is built by Chapman for either automatic or manual control of a variety of liquids or gases. It is easy to operate . . . easy to maintain . . . free from leakage . . . the answer to many a control problem.

Available for electric, manual or hydraulic operation . . . with the particular type of controls best suited to the requirements of the installation. Write today for full information.

The
CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASS.

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. September, 1948, Volume 95, Number 9. Published monthly by Gillette Publishing Co. at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; except *this issue*, 75 cents. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second class matter March 4, 1948, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879. Executive and Business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

Serving Large Paper Mill and Town



● Hardinge Automatic Back Wash Rapid Sand Filter Using ALOXITE Porous Plates

Operated steadily for more than a year, this 1100 sq. ft. Hardinge filter, equipped with ALOXITE aluminum oxide underdrain plates, has proved eminently satisfactory. Installed by the paper mill, it supplies water to both mill and town.

Using a 10½" deep sand bed, solids removal of over 97% is accomplished. The effluent averages less than 1 ppm. of suspended solids. And this is achieved without chemical treatment of the raw reservoir water.

With ALOXITE porous plates on the job, there is no need for graded gravel. Eliminated, therefore, are the difficulties encountered so frequently with gravel-sand combinations. Backwash water is distributed uniformly. Affording full use of the automatic backwashing principle as applied to this unit, continuous operation and lower maintenance expense are assured.

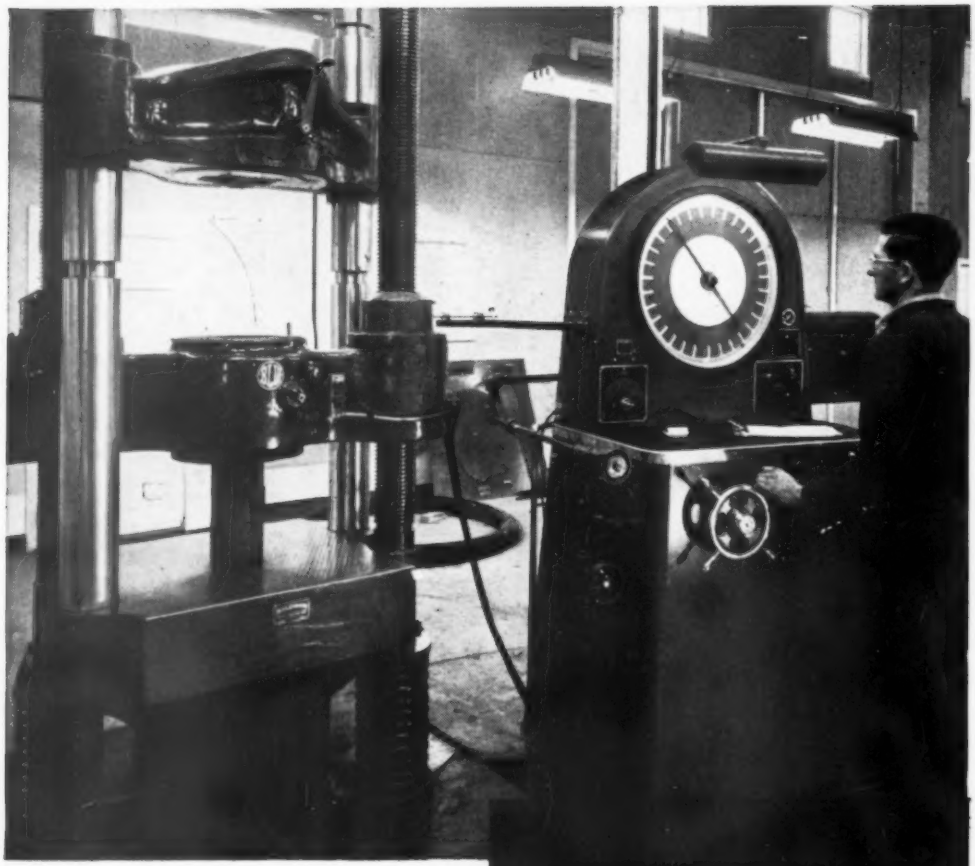
Adaptable to new or old, large or small gravity and pressure units, the ALOXITE underdrain system provides highly worth while savings. Check its possibilities for your filters. Complete details will be furnished by our engineers. Write Dept. M-98, The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.

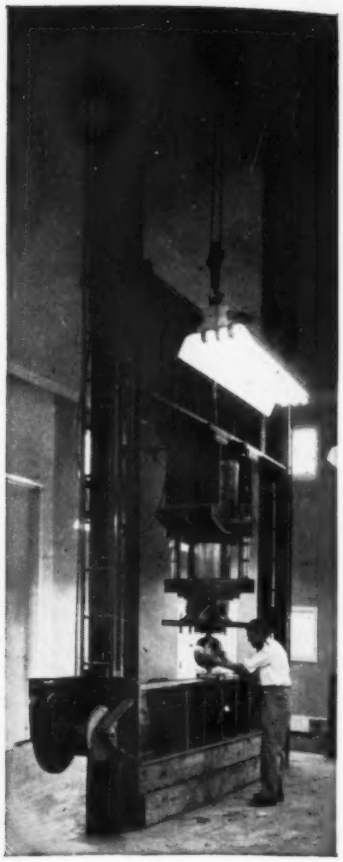
Underdrain Plates

BY CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company





ABOVE: Calibrating Testing Equipment at the Wharton Laboratory

ABOVE LEFT: Testing Concrete Cylinder for Compressive Strength

CONSTANT TESTING assures top quality

All materials used in the manufacture of Lock Joint Prestressed Concrete Cylinder Pipe are carefully tested to assure their uniformly high quality.

In Lock Joint's Laboratory at Wharton, New Jersey, accurately calibrated testing equipment checks the physical properties of all materials which constitute the finished product and test the physical characteristics of the completed pipe.

This constant check on all materials used in Lock Joint Pressure Pipe assures the top quality and long, useful service ot the finished product.

LOCK JOINT *Reinforced Concrete* PRESSURE PIPE

SCOPE OF SERVICES

Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PIPE COMPANY

P.O. Box 269, East Orange, N.J.

Pressure Pipe Plants:
Wharton, N. J. • Turner, Kan.

BRANCH OFFICES:

Cheyenne, Wyo. . . . . Denver, Colo.
Kansas City, Mo. . . . . Joplin, Mo.
Valley Park, Mo. . . . . Chicago, Ill.
Rock Island, Ill. . . . . Wichita, Kan.
Kenilworth, N. J. . . . Hartford, Conn.

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING

Selling Sewer Charges to Industry

Tells the story of how a sewer service charge rate structure, based on a combination of volume and strength of sewage, was developed for a small city. More important, this article reveals how the proposed plan of charging industrial establishments on the volume-strength basis was finally explained to the satisfaction of objecting managements of these plants, who voted approval of the ordinance and the proposed sewer service charge rate structure. The author is—

GEORGE S. RUSSELL*, Pres.,
Russell & Axton, Engrs., St. Louis, Mo.
*President, Federation Sewage Works Assns.

Service Lines as a Factor in Taste and Odor Production

Is an article which will interest a high percent of our readers. No better preview of this article can be given than that revealed in its title. Those who have read earlier articles by this author will be on the lookout for this one by—

CARL WILSON,
Water Supply Technologist,* Los Angeles.
*Former Chief Chemist, Los Angeles Dept. of Water Supply.

Liquid Digested Sludge

Has proved to be profitable to both the Indiana farmers who use it as fertilizer, and the Marion (Ind.) Sewage Treatment Works which sells it. This method of disposal compares favorably in cost with chemical treatment and filtering. This complete and interesting story of the marketing of "Liquid Farm Fertilizer" is told by one of Marion's leading citizens—

DAVID BACKMEYER, Supt.,
Water & Sewage Works, Marion, Ind.

Chemistry of Water Treatment

Is of particular interest to water purification engineers and chemists, but this series of papers on coagulation and water softening will be read with profit by any person in the field of water supply. These fundamental articles have been prepared from lectures given before a short school by—

DR. A. P. BLACK,
Prof. of Chemistry, Univ. of Florida

Operation of Small Filtration Plants

Is the subject of a current series of short articles dealing with the operation and maintenance of small filtration plants by an author who has had considerable experience—

A. E. CLARK, Gen'l Mgr.,
Nashville (Tenn.) Suburban Util. Distr.

Geologic Correlation and Hydrologic Interpretation of Water Analyses

Is the rather imposing title of an article on the highly important problem of ground-water recession and experimental recharge of aquifers. This particular study was made at Peoria, Ill., and is reported by—

T. E. LARSON, Chem. Div. Head,
State Water Survey, Urbana, Ill.

Preconditioning and Digestion of Sewage Sludge

Is to be discussed in a series of articles by a well qualified author with considerable plant operating experience. These articles are based on lectures by the author before the Short School for Sewage Works Operators at Penna. State College. Although written especially for the benefit of plant operators, these articles are not without value as a guide to plant designers. The contributor, already known to our older readers, is—

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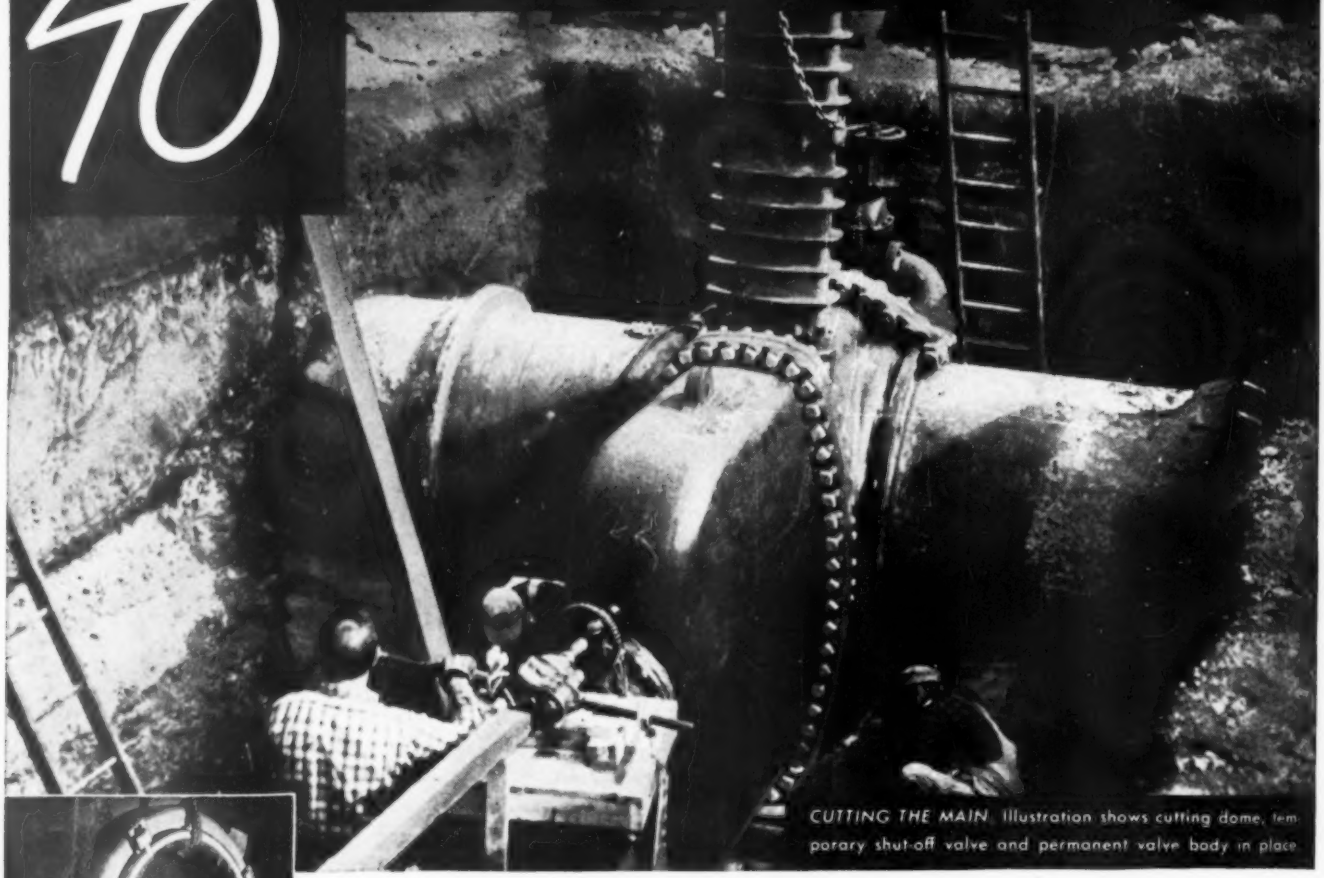
(Member—Audit Bureau of Circulation and Associated Business Papers.)

48" GATE VALVE INSERTED UNDER PRESSURE

to Avoid Stoppage of Steel Production



CUTTING THE MAIN. Illustration shows cutting dome, temporary shut-off valve and permanent valve body in place

Section removed from main

Finished insertion

At a large Eastern steel mill uninterrupted production depended upon a thirty year old, 48" cast iron main, carrying sea water used for cooling the furnace jackets. The main was in poor condition — badly corroded and electrolytically pitted.

In order to provide an emergency by-pass in the event of line failure, a gate valve was required. Since the mill could not risk even a momentary shut down, Smith was asked to insert the valve under pressure. Although of unprecedented size, the insertion was completed in four days without interruption of service or reduction in pressure.

*First 48" insertion ever made under pressure. One month later a second 48" gate valve was inserted by Smith for the Water Bureau, Philadelphia, Pa.

29

GATE VALVES
CHECK VALVES
FIRE HYDRANTS
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.
ESTABLISHED 1896
EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

THEY LAUGHED WHEN THEY SAT DOWN AT THE TABLE...

BUT...

THEY FROWNED WHEN THEY TASTED THE WATER!

Nobody is willing to put up with unpalatable water . . . and no one is willing to "shut up" about it, either.

Bad tastes and odors in water . . . and the complaints about them . . . can be eradicated by the simple, inexpensive application of Aqua Nuchar Activated Carbon.

This is the Activated Carbon that is *exclusively* prepared for water purification. Its millions of microscopic pores are the result of decades of research by Industrial Chemical Sales' technicians to produce a Nuchar with the proper degree of adsorption to remove water impurities.

These impurities can appear overnight, so it's wise to treat constantly with Aqua Nuchar. If additional tastes and odors crop up, the dosage of Aqua Nuchar can be increased.

Be prepared for an unexpected siege of unwanted tastes and odors in your water supply. Investigate Aqua Nuchar *now*. Helpful suggestions from the Aqua Nuchar research laboratories on request.

INSURES PALATABLE NUCHAR DRINKING WATER

industrial CHEMICAL SALES

division west virginia pulp and paper company

NEW YORK CENTRAL BLDG.
230 PARK AVENUE
NEW YORK 17, N. Y.

PURE OIL BLDG.
35 E. WACKER DRIVE
CHICAGO 1, ILLINOIS

PUBLIC LEDGER BLDG.
INDEPENDENCE SQUARE
PHILADELPHIA 6, PA.

LEADER BLDG.
526 SUPERIOR AVE., N.W.
CLEVELAND 14, OHIO

now Top Precipitated Calcium Carbonate ● *Nuchar Activated Carbons* ● *Liqro Crude Tall Oil* ● *Indusoil Distilled Tall Oil* ● *Tallene Tall Oil Pitch* ● *Tallex Abietic Acid* ● *Sulfate Wood Turpentine* ● *Alpha Pinene* ● *Beta Pinene* ● *Polycel Cellulose Fibers* ● *Indulin (lignin)*

ANYWAY YOU LOOK AT IT—RIGHT SIDE UP OR UPSIDE DOWN—IT'S STILL

96%

HERE'S THE EVIDENCE

A Joint Committee representing the American Water Works Association, the New England Water Works Association and the Institute of Water Supply Utilities has directed a recently completed survey of water works facilities in 25 cities, large and small, from Canada to Florida. These cities represent a cross-section of water service conditions throughout North America. They had laid 50 million feet—nearly 9500 miles—of 6-inch and larger cast iron water mains since 1817. The survey shows that 96% of all 6-inch and larger cast iron pipe *ever laid* in these cities is still in service.

The objective of the survey was to secure factual evidence of service life which could be accepted by the water works industry as valid on a nation-wide basis. Isn't it logical, therefore, to conclude that 96% of all 6-inch and larger cast iron water mains, *ever laid in America,* are still in service?

CAST IRON PIPE

Of all the cast iron water mains ever laid in 25 representative cities since 1817 in sizes 6 inch and larger 96% are still in service

THESE ARE THE CITIES

Alexandria, Virginia • Babylon, New York • Clinton, Iowa • Clyde, New York
Denver, Colorado • Des Moines, Iowa • Detroit, Michigan • Huntington, W. Va.
Jamaica, New York • Merrick, New York • Norwich, New York • Ottawa, Ontario
Philadelphia, Pennsylvania • Portland, Maine • Rochester (Suburban), N. Y.
St. Mary's, Pennsylvania • St. Paul, Minnesota • Sag Harbor, New York
Scranton, Pennsylvania • Springfield, Massachusetts • Summit, New Jersey
Syracuse (Suburban), N. Y. • Utica, New York • West Palm Beach, Florida
Winnipeg, Manitoba

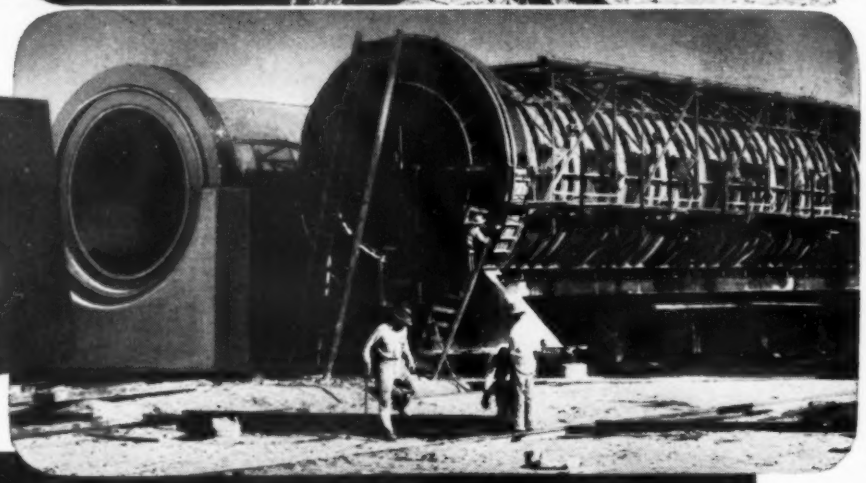
READ THE WHOLE STORY

A 566-page book entitled "Survival and Retirement of Water Works Facilities" has recently been published by the American Water Works Association, 500 Fifth Avenue, New York. It describes the plan and purpose of the survey and reports the findings in detail for each city. We have reprinted, by permission, the findings as they pertain to cast iron water mains in a brochure, "Survival and Retirement Experience with Cast Iron Water Mains," which will be sent upon request. Write to Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Ave., Chicago 3, Illinois.

CAST IRON

SERVES FOR CENTURIES

Whether it's a 12 in. pipe



or a 12 ft. pipe

CONCRETE
makes the ideal pipe

SMALL LATERAL SEWER or the world's largest pipe (12 ft. I. D. x 100 feet long, installed in the Los Angeles ocean outfall sewer at Hyperion) concrete pipe fits any sewerage, drainage or water line need as proved by its use in hundreds of communities throughout the nation.

Concrete pipe can be designed for practically any combination of engineering requirements and local or climatic conditions. When you specify concrete pipe you get:

STRENGTH AND DURABILITY to resist severe impact, to sustain heavy overburdens and to render long years of continuous, dependable service.

MAXIMUM HYDRAULIC CAPACITY because of its smooth interior finish; its clean, even joints, and the absence of tuberculation.

HIGH WEAR RESISTANCE to abrasion by suspended grit in high-velocity flow.

MINIMUM INFILTRATION AND LEAKAGE because of tight joints and uniformly dense concrete.

ECONOMICAL SERVICE because its moderate first cost plus its long life and small maintenance expense result in ***low annual cost,*** the true measure of economy and the taxpayers' goal.

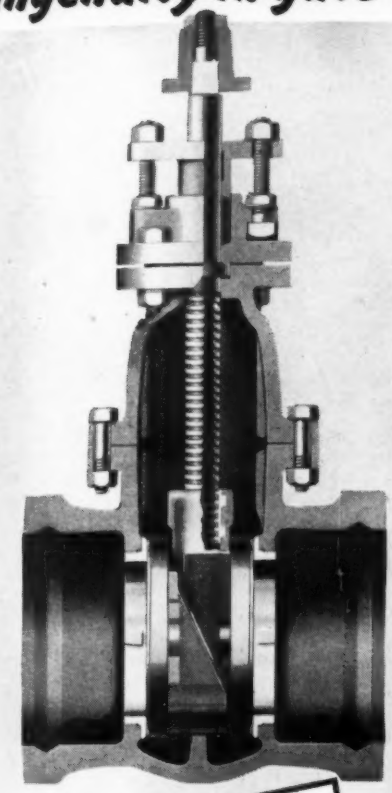
These qualities make concrete the efficient, economical pipe material.

PORTLAND CEMENT ASSOCIATION

DEPT. 9-29 • 33 W. GRAND AVENUE • CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

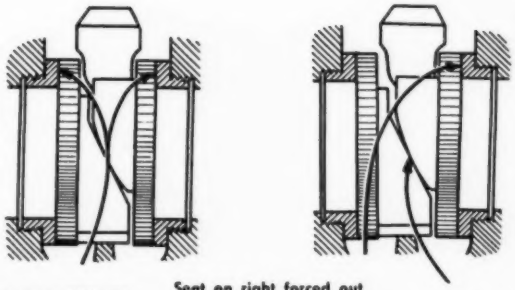
*Ingenuity in gate valve design fulfills seven objectives**



*This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- Positive, easy closing—regardless.
- Automatic adjustment for valve body distortion.
- Elimination of disc-to-seat friction and galling.
- Uniform wear distribution.
- Extreme simplicity.
- Greater service life.
- Simplified maintenance.

AUTOMATIC ADJUSTMENT for valve body distortion



Discs line up parallel with seats when valve is new.

Seat on right forced out of line by body distortion but disc adapts itself to give positive closing.

Curved face of wedge allows discs to adjust tightly against both seats.

ALL valves regardless of size or construction are subject to body distortion—usually a continuous, although minute, process. The causes are many, including high temperature, high pressure, and line strains due to misalignment of piping. Whatever the cause, this distortion forces valve seats out of position and ordinarily means trouble . . . leaky valves, down-time, part replacements, and costly maintenance.

Now take a close look at the diagram above. Note how Darling's unique design automatically compensates for body distortion and the resulting misalignment of seats. The face of the upper wedge is radiused, while the adjacent side of the lower wedge is straight. Thus disc-to-seat pressure is always equalized, affording tight 360° seating despite horizontal or vertical changes in valve seat position.

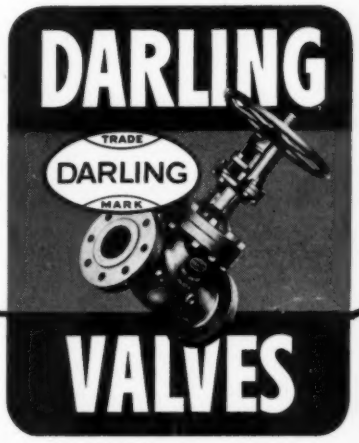
So, for prolonged leak-free service, specify Darling Fully Revolving Double Disc Parallel Seat Gate Valves—the only valves embodying these design features.

DARLING VALVE & MANUFACTURING CO.
Williamsport 11, Pa.

Darling Parallel Seat Gate Valves are available in a wide range of sizes and for all types of normal and unusual service, and for pressures up to 3000 pounds. Likewise, Darling Taper Seat, Solid or Slotted Wedge Gate Valves are available for most services.

Corrosion resistant valves. *In addition to conventional iron, bronze and steel types, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 60 years of experience in meeting unusual requirements is always at your service.*

Outline your needs and ask for specific data on the proper Darling Valves . . . or send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of *all* types and is full of valuable information.



THE VALVE MARK OF QUALITY . . . WATCH FOR IT

Worthington-Gamon WATCH DOG WATER METERS

The meter used by thousands of municipalities in the U. S. and abroad.

G8-2

SURE TO MEET YOUR SPECIFICATIONS FOR ACCURACY, LOW MAINTENANCE, LONG LIFE

Before you invest in water meters, get acquainted with the design and performance advantages which make Worthington-Gamon Watch Dog Water Meters first choice of so many municipalities and private water companies in the United States.

WATCH DOG WATER METERS

"Watch Dog" models . . . made in standard capacities from 20 gpm up; frost-proof and split case in household sizes. Disc type, Turbine type or Compound type. Write for Bulletin.

WORTHINGTON-GAMON METER COMPANY

296 South Street, Newark 5, New Jersey

Subsidiary of

WORTHINGTON

PUMP AND MACHINERY CORPORATION

"The Boss likes lots of HTH handy"

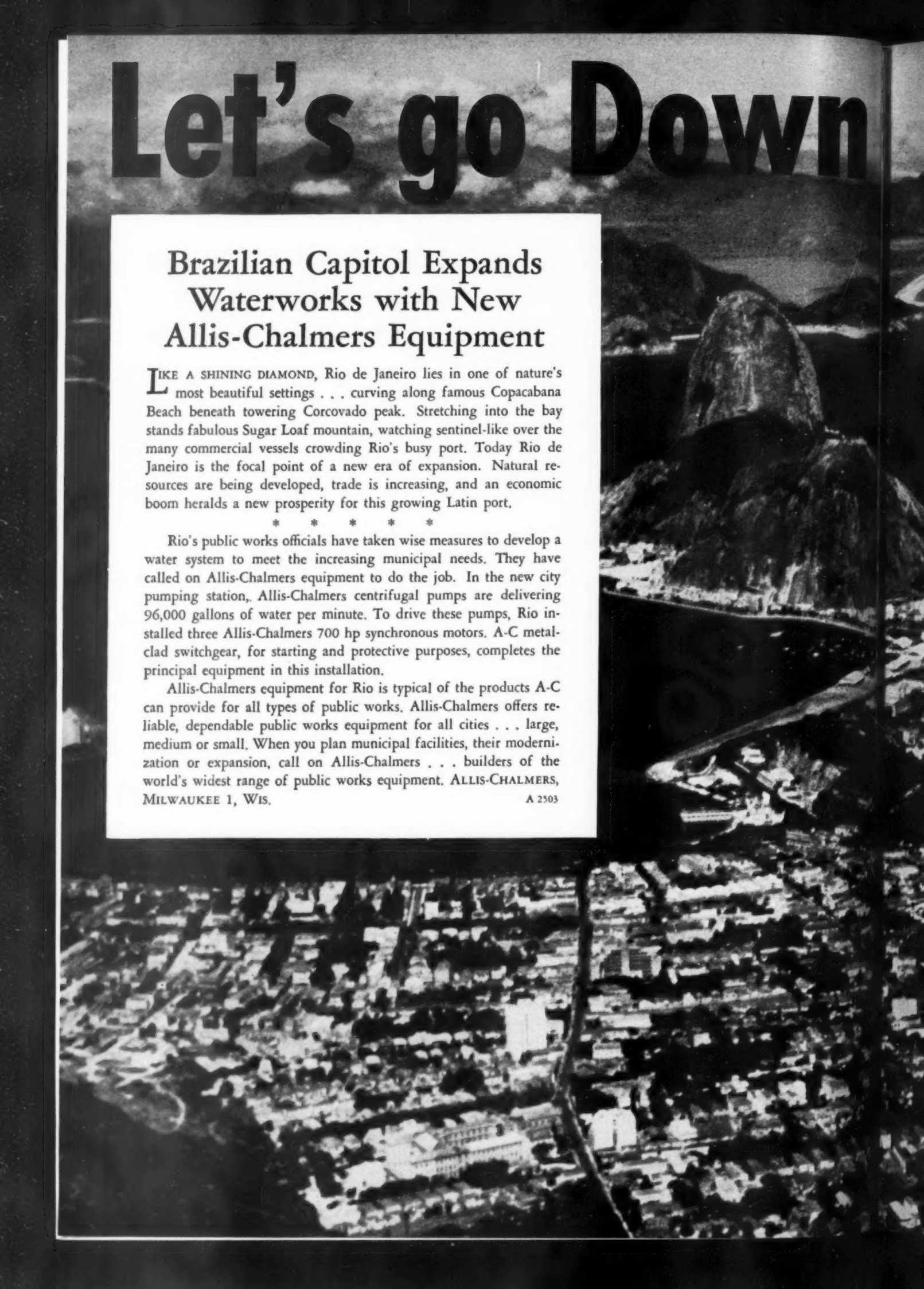
Sanitation HTH is available in cases of nine 5-lb. cans and in 100-lb. drums.

This Water Works Chief won't run short of HTH. Any time it comes to sterilizing a new main, an aqueduct or tank, he's got the wherewithal. There's plenty of HTH for removing slime accumulations or algae...cleaning reservoirs, basins, flumes. And in case of power shut-off, accidental pollution, floods or other emergencies—he's on top for having HTH on hand.

You, too, will find it helpful to keep this low-cost, dependable chlorine carrier handy. Full details in the 1948 booklet: "Hypo-Chlorination of Water". Write for your copy. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

Sanitation HTH . . . Liquid Chlorine . . . Chlorine Dioxide . . . PH-Plus (Fused Alkali) . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate

Mathieson
SANITATION HTH



Brazilian Capitol Expands Waterworks with New Allis-Chalmers Equipment

LIKE A SHINING DIAMOND, Rio de Janeiro lies in one of nature's most beautiful settings . . . curving along famous Copacabana Beach beneath towering Corcovado peak. Stretching into the bay stands fabulous Sugar Loaf mountain, watching sentinel-like over the many commercial vessels crowding Rio's busy port. Today Rio de Janeiro is the focal point of a new era of expansion. Natural resources are being developed, trade is increasing, and an economic boom heralds a new prosperity for this growing Latin port.

* * * * *

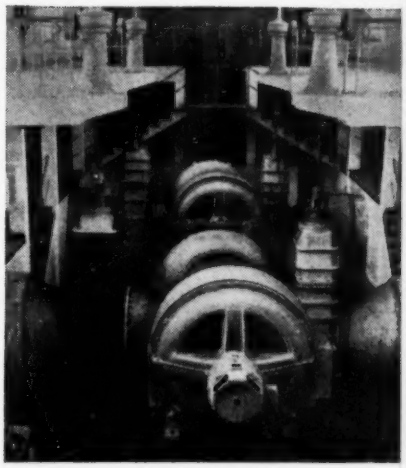
Rio's public works officials have taken wise measures to develop a water system to meet the increasing municipal needs. They have called on Allis-Chalmers equipment to do the job. In the new city pumping station, Allis-Chalmers centrifugal pumps are delivering 96,000 gallons of water per minute. To drive these pumps, Rio installed three Allis-Chalmers 700 hp synchronous motors. A-C metal-clad switchgear, for starting and protective purposes, completes the principal equipment in this installation.

Allis-Chalmers equipment for Rio is typical of the products A-C can provide for all types of public works. Allis-Chalmers offers reliable, dependable public works equipment for all cities . . . large, medium or small. When you plan municipal facilities, their modernization or expansion, call on Allis-Chalmers . . . builders of the world's widest range of public works equipment. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

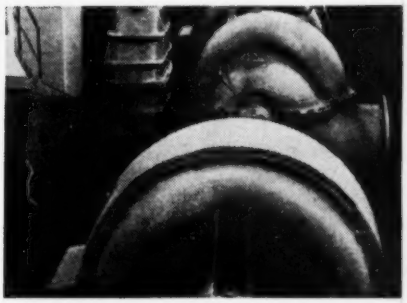
A 2503

to Rio!

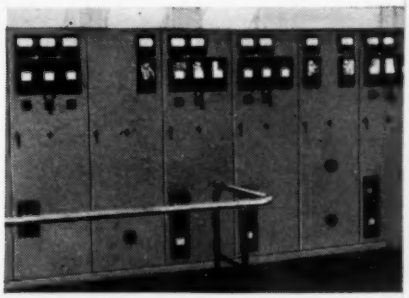
Allis-Chalmers Provides Major Equipment For New Rio Waterworks Plant



OVERALL VIEW of new plant shows Allis-Chalmers synchronous motors driving A-C centrifugal pumps with A-C metal-clad switchgear in background.



CENTRIFUGAL PUMPS are rated 32,000 gpm each against a 68 ft head. Driven by three 700 hp, 500 rpm, 6000 volt synchronous motors.



COMPLETING the A-C electrical equipment in the Rio plant is this bank of metal-clad switchgear for starting synchronous motors.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

Purified Water
for manufacturing purposes

pumped from the river along side your plant?

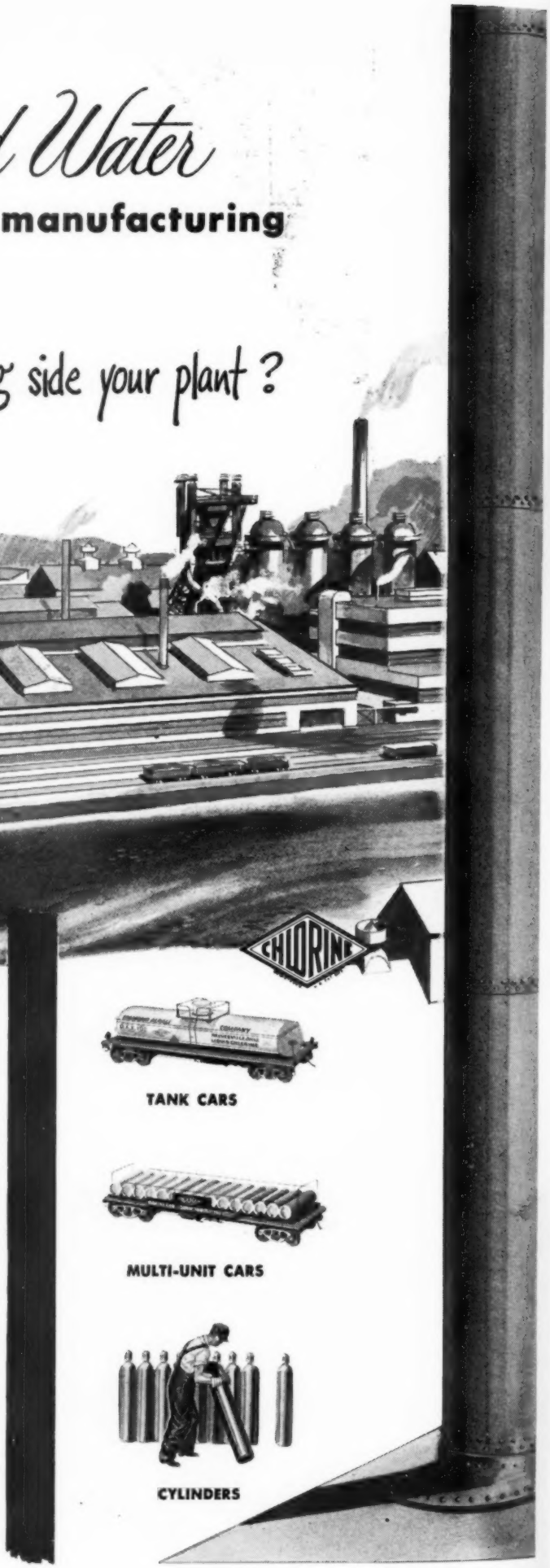
DIAMOND
Liquid Chlorine

can definitely make this convenient water supply available for your plant operations

Chlorination of human and industrial wastes *before* they enter our rivers and streams is the aim of federal, state and local programs for the elimination of stream pollution. Their eventual success will make convenient purified water sources available for industrial and civic use. Diamond Liquid Chlorine is playing an important role in the development of this overall program by industries and communities.

DIAMOND ALKALI Chemical Products

DIAMOND ALKALI COMPANY
CLEVELAND 14, OHIO

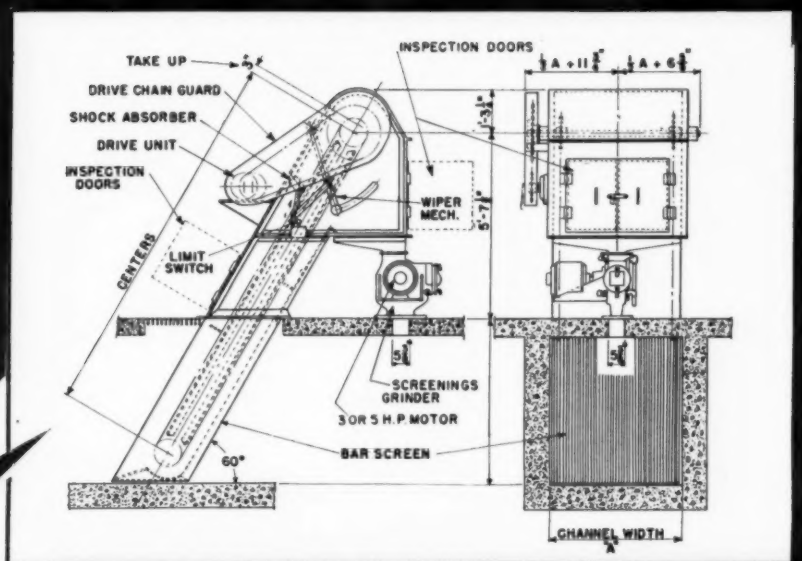


TANK CARS

MULTI-UNIT CARS

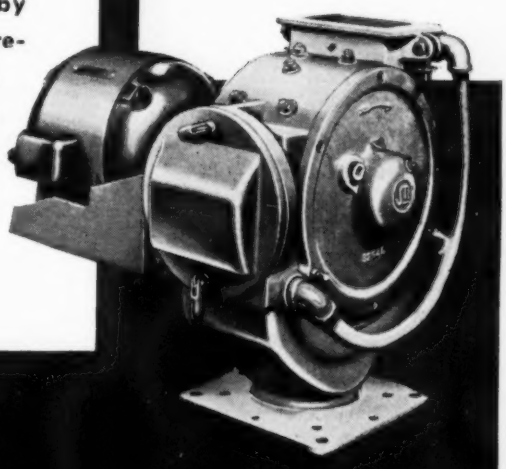
CYLINDERS

THEY WORK TOGETHER...



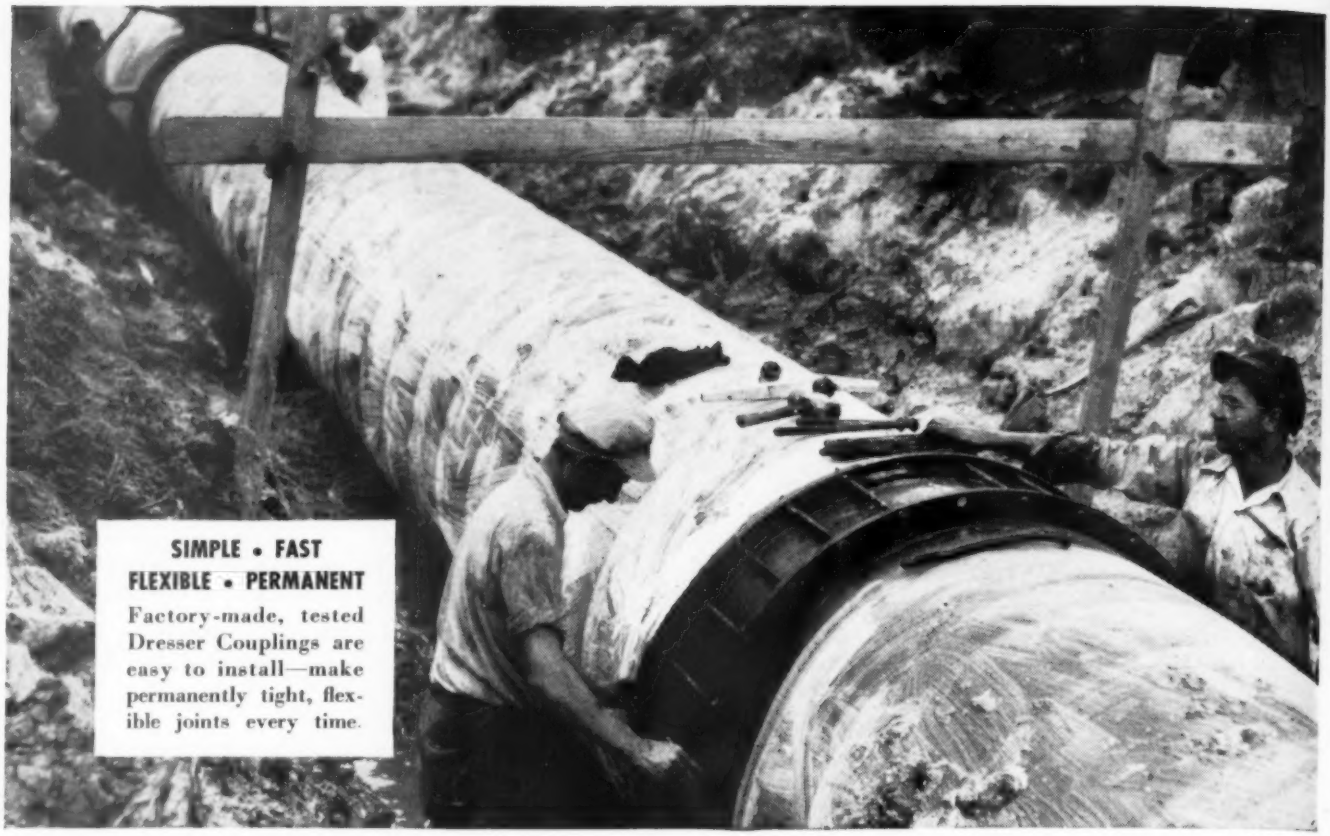
Efficient apparatus for the removal of coarse suspended matter and disposal is this Jeffrey Screen and Grinder combination. It takes care of the final disposal of screenings so important in the treatment of sewage. Screenings collected and disposed of by grinding them to a pulp and returning them to the sewage. This combination is designed for moderate-size treatment plants. We will be glad to go into detail.

Above—Dimension drawing of screen with screenings grinder arranged for hand feeding of screenings.



JEFFREY

ESTABLISHED 1877


SIMPLE • FAST
FLEXIBLE • PERMANENT
Factory-made, tested Dresser Couplings are easy to install—make permanently tight, flexible joints every time.

In Savannah • ANOTHER COUPLED STEEL LINE

Savannah's new surface water supply will flow through nearly 14 miles of 48″ pipe. Here, as in so many cities, a Dresser-Coupled steel line was specified because this type of construction combines speedy installation, excellent performance and maximum safety margin.

Standard lengths of plain-end steel pipe are quickly joined with factory-made Dresser Couplings. Any workman who can use a wrench can make perfect joints every time, even when pipe ends aren't exactly aligned. The couplings permit up to 4° deflection, making it possible to lay curves with straight pipe.

With Dressers, you get the full advantage of modern, glass-smooth pipe linings. The couplings fit outside the pipe. There is no heat to damage the lining, and no need for workmen to go inside the pipe.

Dressers are permanently tight. Their flexibility guards against damage from vibration, earth movement, expansion and contraction. Added to the high tensile strength of steel pipe, these features assure a maximum margin of safety, and lasting efficiency.

Partial list of cities using Dresser-Coupled steel lines

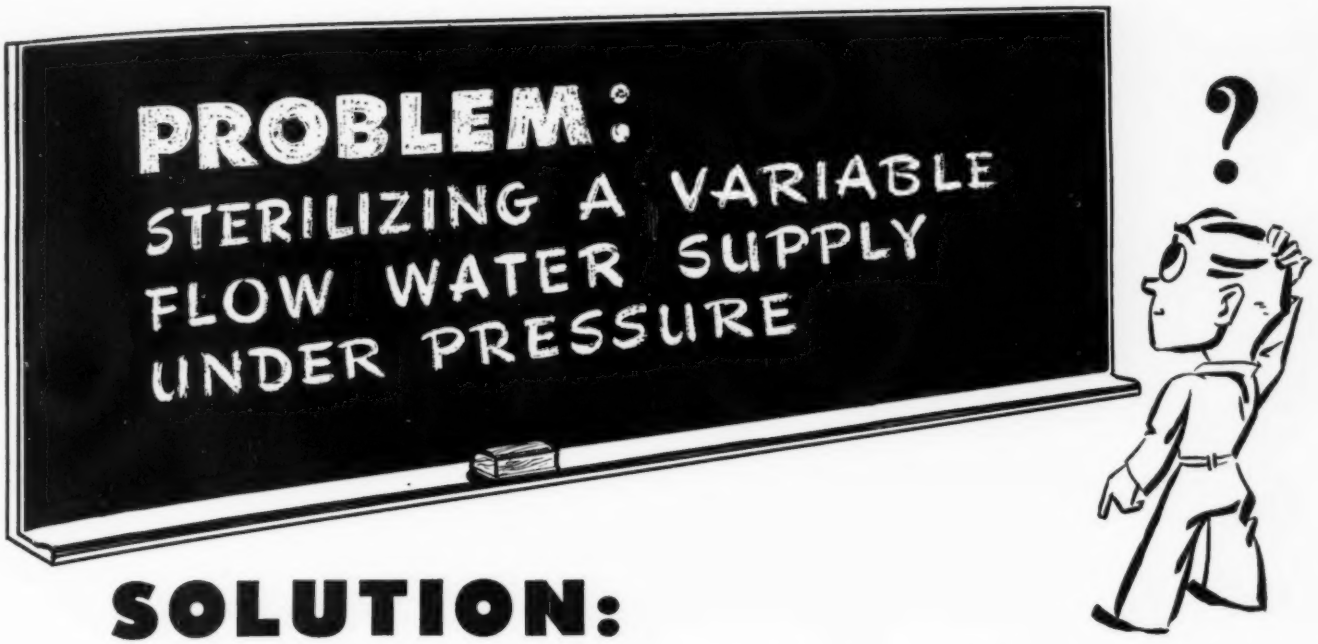
Boston, Mass.	Harrisburg, Pa.	Newark, N. J.
Cleveland, Ohio	Kansas City, Mo.	Portland, Ore.
Oakland, Cal.	Saginaw, Mich.	Augusta, Me.
Syracuse, N. Y.	Milwaukee, Wisc.	Morgantown, W. Va.

FLEXIBILITY IS IMPORTANT HERE

Where lines pass under railroad tracks, vibration is harmlessly absorbed by the resilient gaskets of Dresser Couplings.

DRESSER COUPLINGS

Dresser Mfg. Division, 59 Fisher Ave., Bradford, Penna. (One of the Dresser Industries) • In Texas: 1121 Rothwell St., Houston
In Canada: 60 Front St., W., Toronto • Sales Offices: New York, Chicago, Houston, San Francisco



SOLUTION:

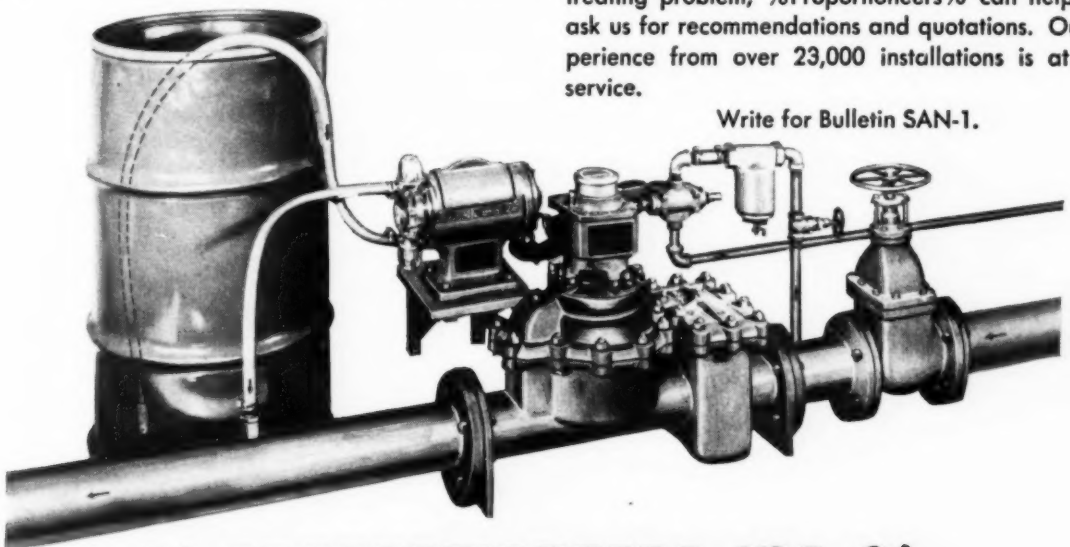
%PROPORTIONEERS% AUTOMATIC AND PROPORTIONAL CHEM-O-FEEDER!

Just install %Proportioneers% Automatic and Proportional Hydraulically operated Chem-O-Feeder and a standard water meter. It is only necessary to know the minimum, average, and maximum flow to be sterilized and the pressures against which the chemical will be injected. All flow is measured by the mechanical water meter and %Proportioneers% equipment starts, varies and stops dosage of chemical in step as the water comes on, fluctuates and tapers off. The %Proportioneers% Low Pressure Chem-O-Feeder shown is treating gravity water supplies against pressures up to 100 p.s.i. Installation is simple and our nearest sales and service representative will assist you in the selection of proper meter and equipment.

RESULT: Fully automatic sterilization of water supply, with chemical fed in strict proportion to flow, without dependence on electricity or other source of power. The only attention required is the occasional refilling of solution tank and checking the chlorine residual to adjust dosage for any variation in the chlorine demand of raw water.

CONCLUSION: Whatever your water treating problem, %Proportioneers% can help you; ask us for recommendations and quotations. Our experience from over 23,000 installations is at your service.

Write for Bulletin SAN-1.



% PROPORTIONEERS, INC. %

9N CODDING ST., PROVIDENCE 1, R. I.

Check YOUR MAINTENANCE COSTS

The final seating of the MUELLER AWWA GATE VALVE is accomplished by the wedging action of pressure applied at 4 POINTS near the *edges* of the double discs. This action, exclusive with MUELLER VALVES, prevents warped or sprung discs and eliminates excessive maintenance costs. No other Gate Valve has this inherent feature of design and construction — No other Gate Valve can give such assurance of long-life, trouble-free performance and minimum maintenance expense. Write for full information.

THE 4 POINT WEDGING ACTION

DEPENDABLE SINCE 1857 FULLY WARRANTED OUR 91st YEAR

MUELLER CO.

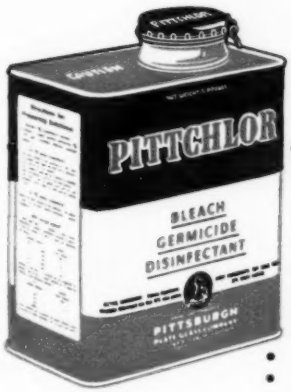
FACTORY: *Chattanooga, Tenn.* MAIN OFFICE AND FACTORY: *Decatur, Ill.*
OTHER FACTORIES: *Los Angeles, Cal.* * * * * *Sarnia, Ont. Canada*

Gee, Orgie, we haven't had a guest since they heard about the new distributor for **PITTCHLOR"**

Yes, indeed, and you and your pal better scram, too, Orgie, because the handwriting's on the wall. The slightest exposure to Pittchlor means sure death to chlorine-susceptible bacteria and algae. So, if you value your life, get going—and fast!

A high-test, stable calcium hypochlorite—containing 70% available chlorine—Pittchlor is extremely effective for the chlorination of water supplies, treatment of sewage, and for numerous other disinfection, deodorization and general sanitation purposes.

Pittchlor is economical and easy-to-use . . . manually or through relatively simple feeding devices.



Packed in 5 lb. resealable cans (9 per case), 3¼ lb. cans (12 per case), 100 and 130 lb. drums.

Distributors Note

A few good areas are still open for distributing Pittchlor. Write today for particulars.

USE THIS COUPON

Pittsburgh Plate Glass Company
Columbia Chemical Division, Dept. D-8064
Fifth at Bellefield, Pittsburgh 13, Pennsylvania

Gentlemen:
Send me information on—

☐ How I can become a Pittchlor distributor
☐ How to use Pittchlor for. . . . . (use intended)

NAME_____

COMPANY_____

ADDRESS_____

COLUMBIA CHEMICALS

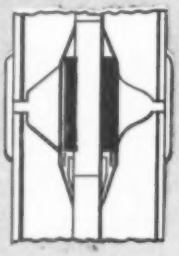
CHICAGO · NEW YORK · BOSTON · CINCINNATI · MINNEAPOLIS · CHARLOTTE · ST. LOUIS · CLEVELAND · PITTSBURGH · PHILADELPHIA · SAN FRANCISCO

PPG

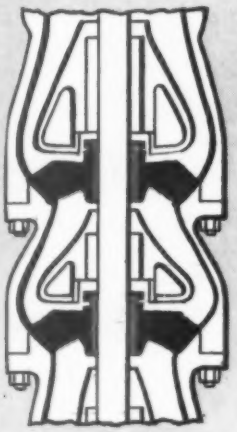
PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

EASY ADJUSTABILITY. With one simple "at the surface" adjustment, you can vary capacities over a wide range without power-wasting "throttling." Adjustment nut can also be used to compensate for wear . . . assuring new pump efficiency *for the lifetime of the pump!*



QUIET, SMOOTH OPERATION. Pomona's revolvable rubber shaft bearings assure vibration-free shaft support under all conditions.



FREEDOM FROM SAND-LOCKING. You won't have any costly stoppages with Pomona. Open impeller design assures complete freedom from sand-locking . . . minimizes wear . . . eliminates the need for sealing or wearing rings.

WATER LUBRICATION. Pomona's *true* water lubrication is your guarantee of clean, clear water. Water lubrication also means simplicity of design with fewer working parts for maximum dependability, lower operating costs, less maintenance.

IT isn't just chance that Pomona gives you all the features you've always wanted in a vertical turbine pump. Lowest-cost-per-gallon service . . . unequalled dependability . . . simplicity of installation and maintenance, these are "designed-in" features resulting from years of experience. Just check these features. You'll find what you want!

WANT GET POMONA!

CHECK THESE and other "wanted" Pomona features with your Fairbanks-Morse Pomona dealer or branch pump engineer. They can show you how the Pomona line . . . sizes from 4 to 36 inches, capacities from 15 to 20,000 G.P.M. . . . gives you more!

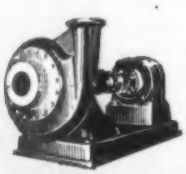
Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

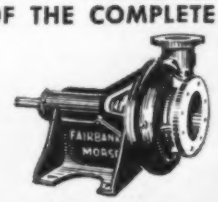
A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

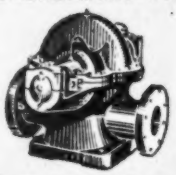
A FEW OF THE COMPLETE LINE OF FAIRBANKS-MORSE PUMPS



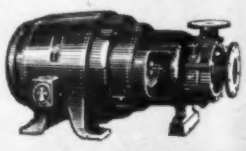
Trash Pumps



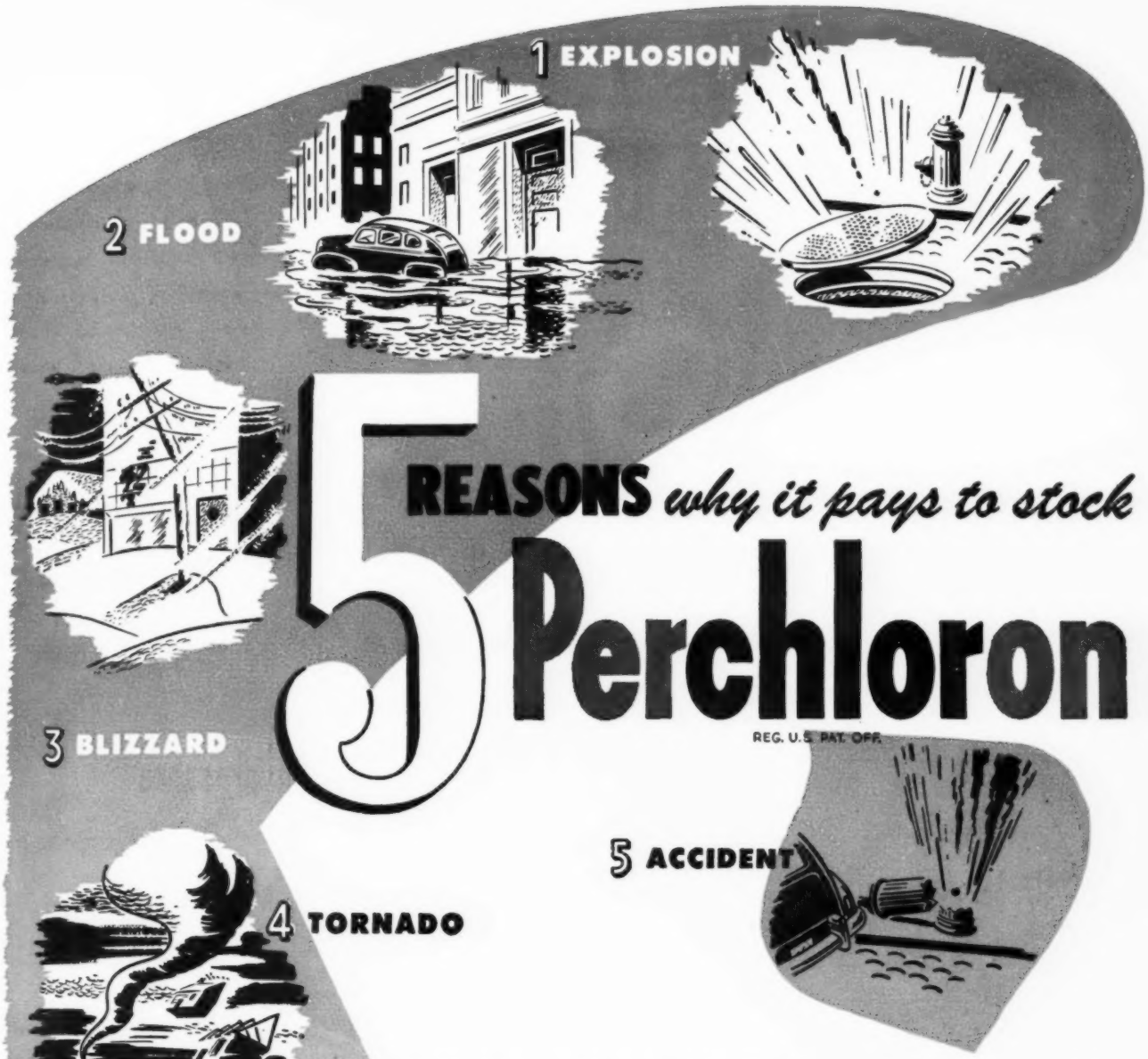
Side-Suction



Centrifugals



Builtogether



5 REASONS *why it pays to stock* Perchloron

REG. U.S. PAT. OFF.

Yes, these sketches illustrate why so many alert engineers maintain a standby supply of Per*chlor*on.

They've found it pays to keep a stock of this handy calcium hypochlorite to help safeguard public water supplies in unforeseen emergencies. Per*chlor*on is stable and uniform. It contains over 70% available chlorine which means that 1 pound of Per*chlor*on is equal to 0.7 pounds of liquid chlorine.

Per*chlor*on is useful in other water treatment functions, too—sanitation of small water systems, new mains, wells, swimming pools. Its properties include the oxidation of ferrous iron in water, removal of hydrogen sulphide, control of most types of algae, and the destruction of chlorine-susceptible bacteria. Write for full descriptive material to Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

PENN SALT
CHEMICALS

Teddy Roosevelt was president when we cleaned Washington's mains in 1907.

1945—National begins a 5 year job.

Cleaning controlled by 2-way radio.

NATIONAL CLEANING AGAIN

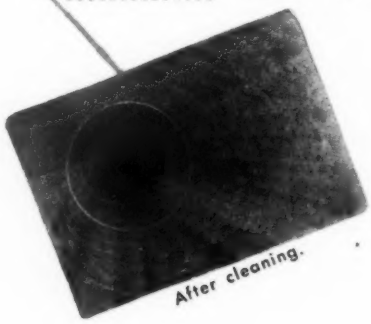
lowers pumping costs

increases volume

increases water pressure

FOR WASHINGTON, D.C.

Before cleaning.



After cleaning.

Way back in 1907 and again in 1926 National successfully cleaned the water mains of Washington, D.C.

In 1945 a five year program to clean and recondition the entire water main system of Washington was begun and National in conjunction with the Centriline Corporation was again awarded the cleaning contract for 1945, 1946, 1947, 1948 and 1949—*in short, the entire cleaning job!*

Tests made on those lines already cleaned and centrilined indicate a co-efficient of over 130 as against less than 90 before cleaning, resulting in lower pumping costs, increased volume and higher pressure.

Let us estimate the cost of restoring your lines to at least 95% of their original carrying capacity. Write today.

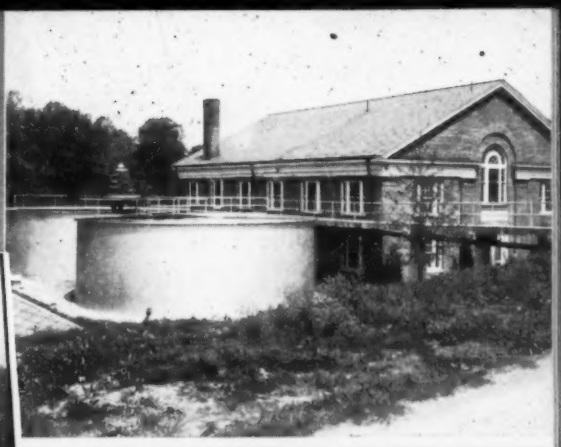
NATIONAL WATER MAIN CLEANING COMPANY

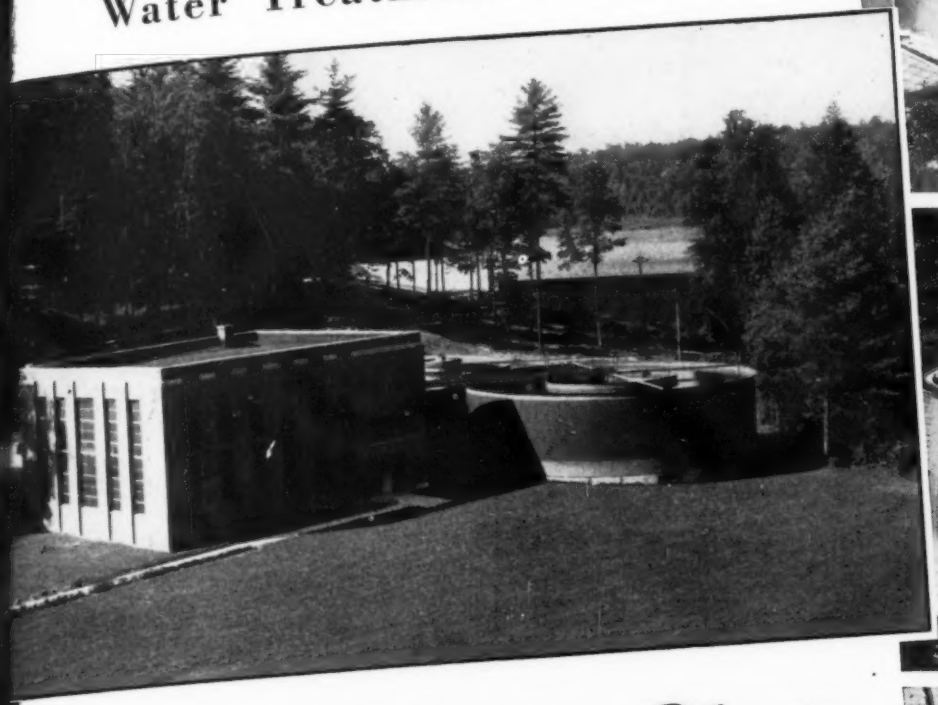
29

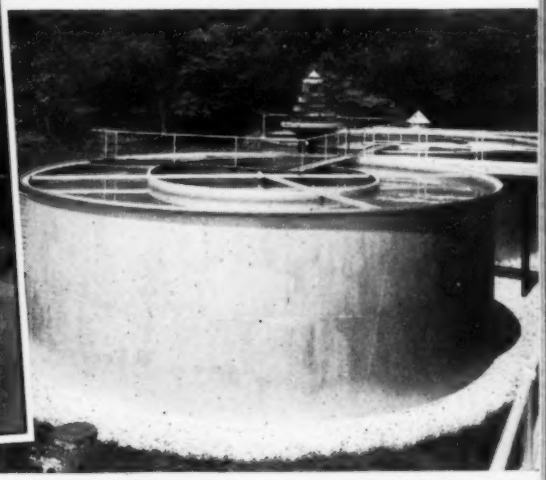
50 Church St., New York 7, N.Y.

ATLANTA, 1221 Mortgage Guarantee Building • BOSTON, 115 Peterboro Street • CHICAGO, Room 1336, 122 So. Michigan Avenue • HOUSTON, 2518 Grant Street • KANSAS CITY, 421 BMA Building • LOS ANGELES, 448 South Hill Street • MEMPHIS, 822 Dermon Building • OMAHA, 3812 Castellar Street • RICHMOND, 210 East Franklin Street • SPRINGFIELD, MO., 844 North Main Street • SALT LAKE CITY, 149-151 W. Second So. Street • SAN FRANCISCO, 681 Market Street • MONTREAL, 2028 Union Ave. • VANCOUVER, B. C., 505 West 1st Ave. • WACO, P. O. Box 887 • WINNIPEG, 576 Wall Street • HAVANA • MAYAGUEZ, PUERTO RICO • BOGOTA • CARACAS • MEXICO CITY

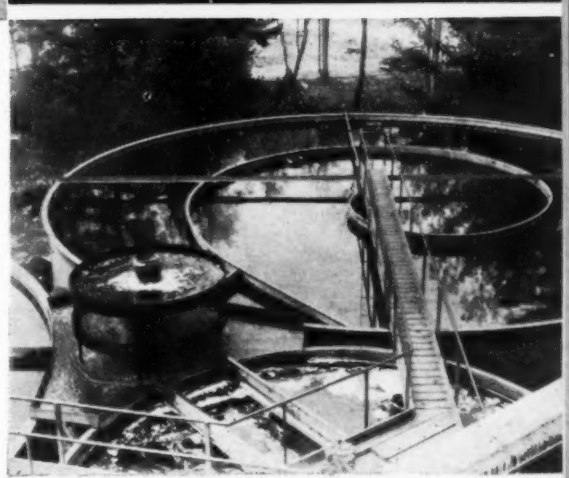
A permanent investment in efficient, economical Water Treatment Facilities







Steel Filtration Plants by Pittsburgh-Des Moines



The permanence of steel, employed for all water-handling equipment from intake point to elevated storage tanks, reservoirs or standpipes, is a modern advantage provided by Pittsburgh-Des Moines Filtration Plant design and fabrication.

We will be glad to consult with you on your water treatment project, and show you in detail the many features contributing to better performance and economy in P-DM Steel Filtration Plants. Write today, without obligation.

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH.....3418 Neville Island
NEW YORK.....Room 918, 270 Broadway
CHICAGO.....1222 First National Bank Building
DES MOINES.....919 Tuttle Street
DALLAS.....1223 Praetorian Building
SEATTLE.....526 First Avenue, South
SANTA CLARA, CAL.....625 Alviso Road

MADISON, WIS.

"One of America's Safest Cities"

The Mathews firemen say

How right they are! Madison, Wisconsin protects life and property with Mathews Hydrants; and wherever there's a Mathews there's safety plus.

Mathews Hydrants have won a special confidence—the kind that only a great record over a long period of time can inspire. In fact, they are the standard of comparison among mechanical-minded buyers. The operating thread cannot rust, freeze or collect deposits. The revolving nut is guarded against entrance of rain, dust and dirt. Threads cannot strip. True compression-type main valve. Full-draining. Leakproof. Working parts housed in a removable barrel—one that can be replaced in a few minutes.

Send for literature on Mathews Hydrants. See why they are selected the world over for extra-dependable duty. Give your community Mathews Hydrants—and safety *plus*.

OTHER MATHEWS FEATURES: Head can be rotated 360° • Replaceable head—nozzle outlets easily changed • Nozzle levels raised or lowered—no excavating • Stuffing-box plate integral with nozzle section —strong, safe, leakproof • Strong, tough, elastic protection case of "Sand-Spun" cast iron • Only one part to oil—the operating thread

MATHEWS HYDRANTS

Made by R. D. WOOD COMPANY

Public Ledger Bldg., Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

Only INFILCO Gives You *ACCELERATED* SOFTENING and CLARIFICATION

RESULTS

More uniform results under varying flows and changing raw water characteristics.

Cleaner effluent—longer filter runs.

More complete chemical utilization.

in the Exclusive ACCELATOR® PROCESS

★ Recirculation of "live" slurry under POSITIVE CONTROL.

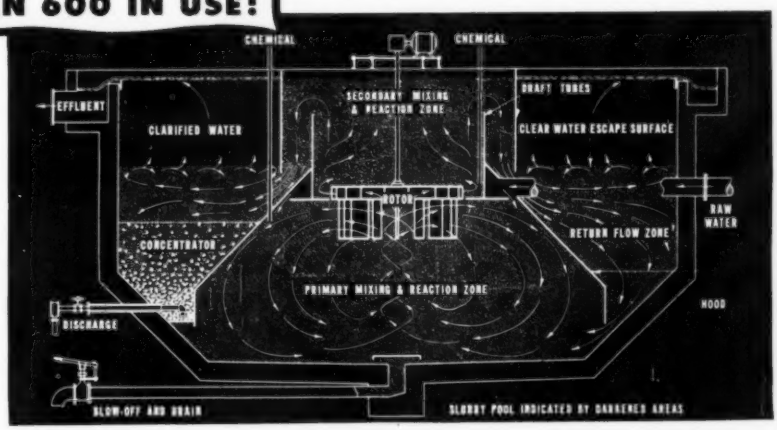
★ Maintenance of the slurry pool at a *constant level* for varying flow rates.

★ Dynamic, high-rate SEPARATION of clear water at the surface of the slurry pool.

★ Continuous concentration and automatic discharge of excess solids.

MORE THAN 600 IN USE!

The large volume of slurry, upon which the beneficial results depend, is doubly effective in the Accelator®. It is an active, moving, *controlled* body whose path is *downward* in the separation zone. One volume of clear water is *displaced* from the downward-moving slurry by one volume of in-coming raw water. This is *dynamic separation* of clear water. In the meantime, several volumes of slurry are recirculated to do their work over and over. The slurry level is actually remarkably *independent* of the through-put rate. In this respect, there is no "sludge blanket," no "filtration," through a mass of spent sludge in the Accelator® process.



Water Conditioning and Sewage Treating Equipment

INFILCO

FIRST for Over FIFTY YEARS

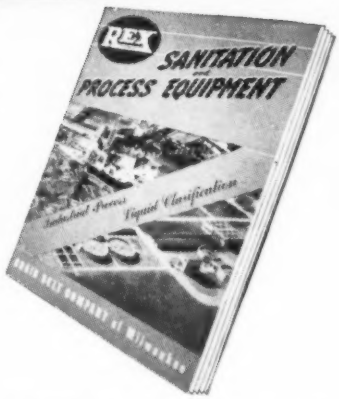
Write or Call nearest Field Engineer or Chicago Headquarters

Atlanta	Cleveland	El Paso	Minneapolis	Pittsburgh	San Francisco
Baton Rouge	Denver	Houston	New York City	Philadelphia	Seattle
Boston	Detroit	Indianapolis	Omaha	St. Louis	Tulsa
Buffalo	Edgefield, S. C.	Los Angeles	Orlando, Fla.	San Diego	

INFILCO INC. • 325 WEST 25TH PLACE • CHICAGO 16, ILLINOIS

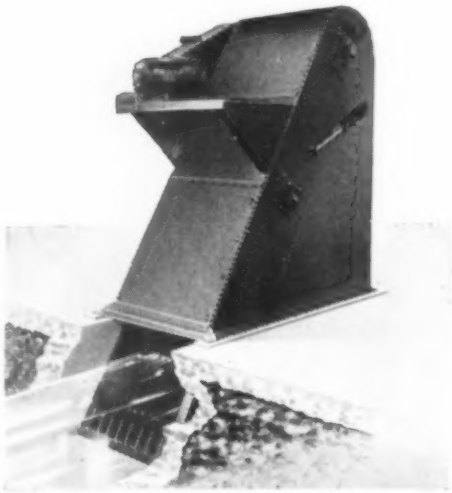
LARGE PLANT OR SMALL...

Rex Provides PROVED Equipment!

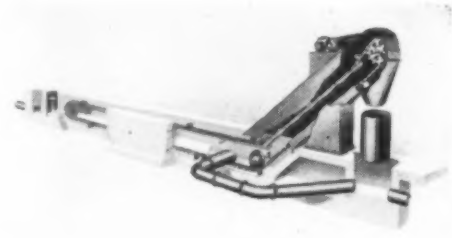


Large plant or small . . . primary or complete treatment . . . domestic or industrial waste, Rex provides the *right* equipment for every liquid clarification or solid separation operation.

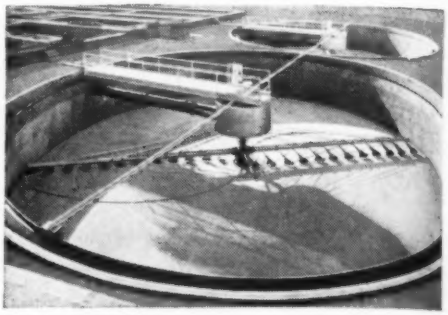
Small plants can obtain equipment that is equally efficient, equally economical and as durable as that for large plants. All Rex equipment and processes are time-tested and proved in hundreds of successful installations. Specially trained Rex sanitation engineers will be glad to help you with your problems. For facts write for your copy of Bulletin No. 46-3. Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.



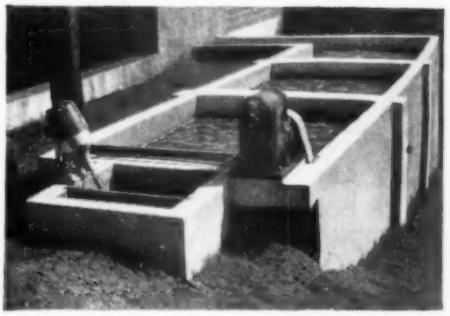
REX MECHANICALLY CLEANED BAR SCREENS are neat in appearance and provide an efficient means of removing large solids from liquids. They are easily installed in new or existing channels and have remarkably low head loss. With side frames recessed in channel walls, they assure an unobstructed flow to the rack.



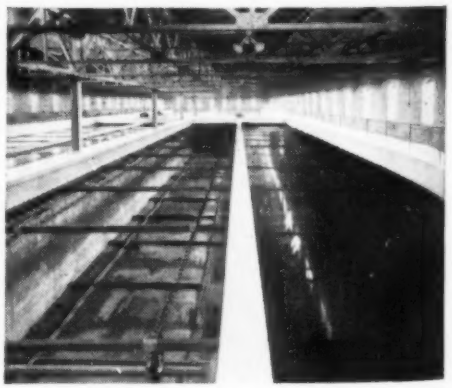
REX TOW-BRO SLUDGE REMOVERS are the only sludge collectors which remove sludge from tank bottom immediately on contact instead of by the usual blowing or scraping. They assure accurate control of sludge removal over a wide range of withdrawal rates. Greater sludge concentration, greater operating flexibility and a clearer effluent are all readily obtainable with Tow-Bro. ▶



REX FLASH MIXERS AND FLOCTROLS provide the necessary rapid dispersement of chemical throughout the liquid, followed by a gently multi-stage slow mixing for optimum floc formation. Floctrol designs assure utilization of full tank volume and important savings in chemicals. ▶



REX CONVEYOR SLUDGE COLLECTORS combine the well-known advantages of the rectangular settling tank with a rugged and efficient form of sludge removal mechanism. Whether handling primary sludge or light flocculent solids, their performance is trouble free and dependable. They rarely need to operate more than a few hours daily. ▶



REX GRIT EQUIPMENT, incorporating the exclusive principle of recirculation, effectively separates and removes inorganic solids from liquids. No grit washer is needed. Long life is assured with minimum maintenance. ◀

REX SANITATION EQUIPMENT

Member of the Water and Sewage Works Manufacturers Association

CHAIN BELT COMPANY of Milwaukee

MODERN PIPE *for* *Modern Service Requirements*

MODERN USAGE is continually making increasingly severe demands on pipe lines. Underground mains must do much more than merely resist corrosion. They must convey greater volumes, at higher internal pressures; they must withstand vastly increased external loadings; they must be adapted to an ever-widening range of service conditions. Mono-Cast Pipe possesses the exceptional physical strength and uniformity necessary to meet these requirements.

Long service with minimum maintenance, coupled with simplicity in installation, make Mono-Cast Pipe a favorite for systems conveying water, gas, oil, sewage or other liquids under high, medium or low pressures. Supplied with or without tar coating, cement or Enameline lining in sizes 3-inch through 48-inch.

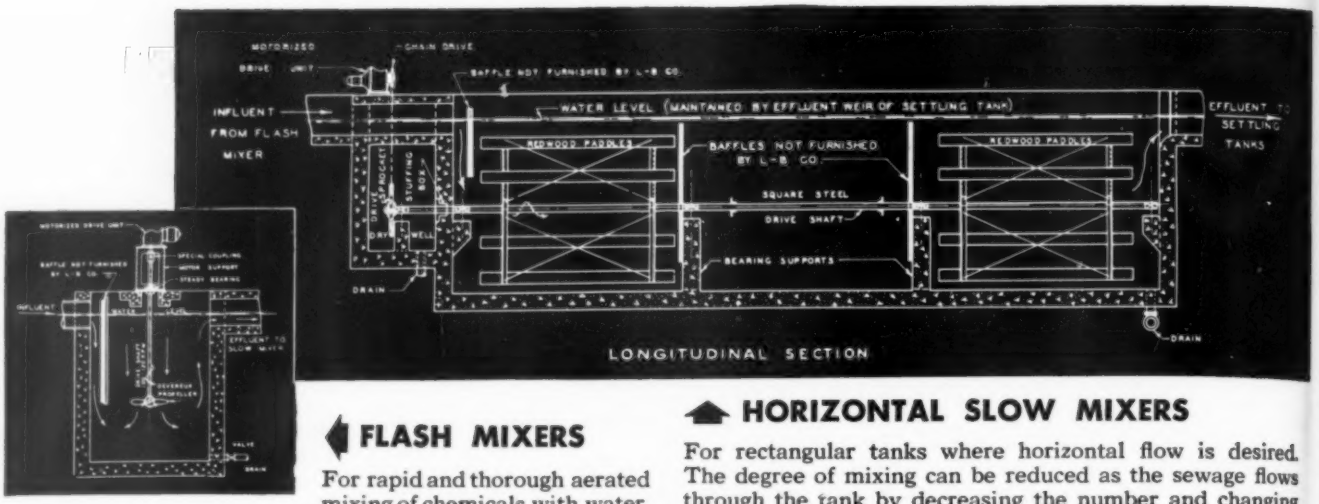
Mono-Cast Pipe serves equally well beneath crowded city streets or in cross-country installations. View at right shows a 36-inch Mono-Cast bell and spigot water line serving Oklahoma City, Oklahoma.

AMERICAN CAST IRON PIPE COMPANY

Birmingham 2, Alabama

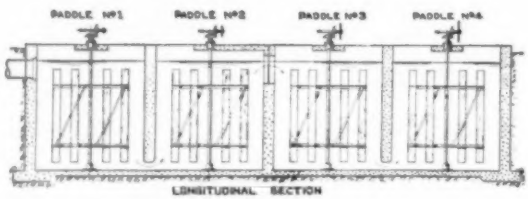
LINK-BELT

Equipment for Water Works



◀ FLASH MIXERS

For rapid and thorough aerated mixing of chemicals with water, sewage or industrial liquids. Large, efficient four-blade propellor operates without under water bearings.

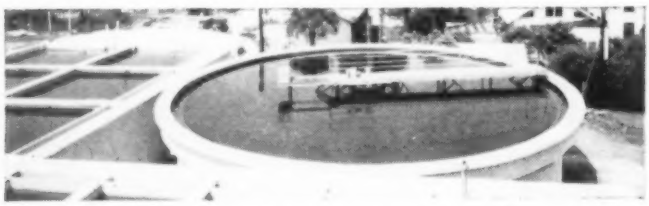


VERTICAL SLOW MIXERS ▲

For square tanks which can be operated singly or in a series of two, three or four. These mixers will provide efficient mixing and flocculation where vertical flow is desired. The mixers can be operated at a decreasing rate of speed to produce the maximum size floc. Send for Folder No. 2042.

STRAIGHTLINE SLUDGE COLLECTORS ▶

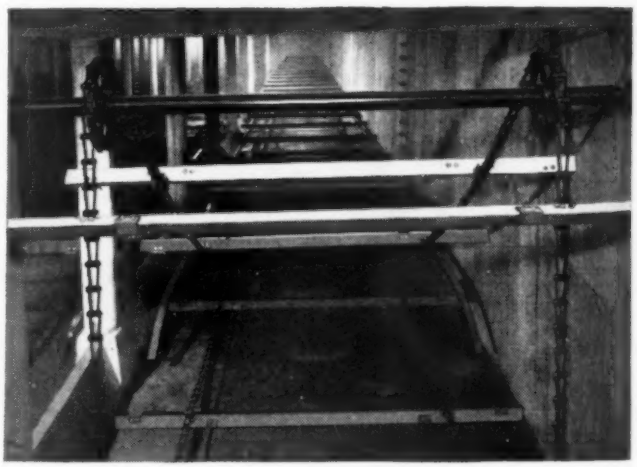
Link-Belt Straightline collectors are used exclusively in the settling tanks of the Lake Erie Water Project, City of Toledo Filter Plant. Each of the four tanks, which are 85′5″ wide by 16′6″ deep by 270′ long, employ five longitudinal collectors and one cross collector—a total of 24 collectors being used. Each collector has an individual motor and drive. They are completely covered, as illustrated in the photograph to the right. Send for Book No. 1742.



▲ HORIZONTAL SLOW MIXERS

For rectangular tanks where horizontal flow is desired. The degree of mixing can be reduced as the sewage flows through the tank by decreasing the number and changing the pitch of the paddles.

For square tanks which can be operated singly or in a series of two, three or four, the vertical type is used. These mixers will provide efficient mixing and flocculation where vertical flow is desired. The mixers can be operated at a decreasing rate of speed to produce the maximum size floc. Rapid mixing must be followed by efficient, gentle, slow mixing to produce maximum size floc. Vertical or horizontal types of slow mixers may be used. Send for Folder No. 2042 which describes both the flash and slow mixers.



◀ CIRCULINE SLUDGE COLLECTORS

Link-Belt Circuline collectors for the removal of sludge from round tanks, assure positive, slow, uniform speed; positive sludge removal and excellent distribution of flow throughout the tank. Send for Book No. 1982.

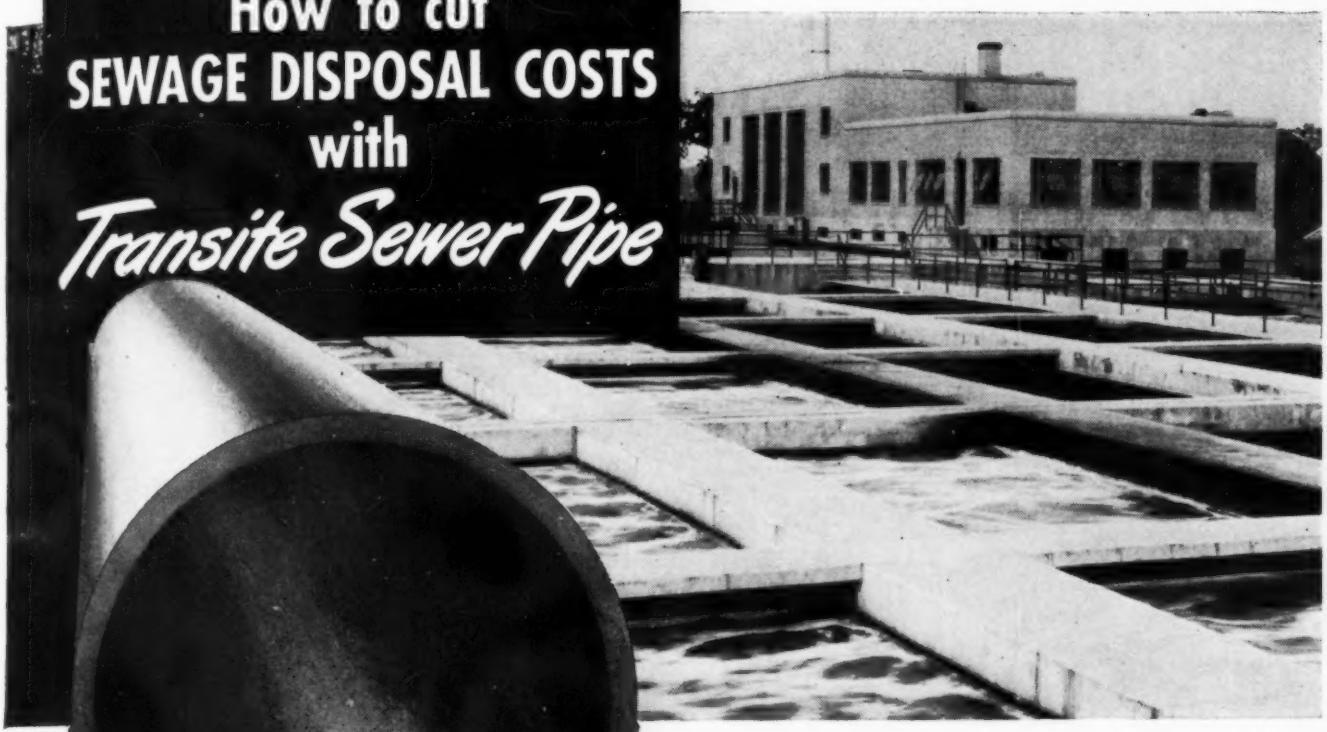
Link-Belt sanitary equipment engineers are ready to supply helpful information and recommendations on applying the correct Link-Belt equipment to the solution of your problems. Write our nearest office, today, for information.

11.190

LINK-BELT COMPANY

Philadelphia 40, Chicago 9, San Francisco 24, Indianapolis 6, Atlanta, Dallas 1, Minneapolis 5, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

How to cut SEWAGE DISPOSAL COSTS with *Transite Sewer Pipe*



Reduced Treatment Costs

Two features of Transite* Sewer Pipe present an opportunity for important savings in the treatment of sewage:

1. Sleeve-type joints that make up tight and *stay* tight in service.

2. Long 13-foot lengths that mean fewer joints in the finished line.

This double safeguard against infiltration—*tighter* joints as well as *fewer* joints—has the practical effect of reducing the load at the disposal plant . . . often to the extent that overall treatment costs are substantially cut.

This reduction in sewage load also enables plant capacity to be conserved for future needs. And, where new treatment facilities are being planned, it permits consideration of a smaller plant . . . with possible economies in both buildings and equipment.

Transite offers other economies, too. Other important savings are possible with this pipe because it has an exceptionally smooth interior which offers minimum resistance to the flow of sewage. Its flow capacity is unusually high—n=.010. This often permits use of flatter grades and shallower trenches—with correspondingly lower excavation costs. Or, as an alternate economy, smaller diameter pipe may be used.

Low maintenance through the years. Made of asbestos and cement combined into a homogeneous material of great stability, Transite Sewer Pipe is corrosion-resistant. Tight joints safeguard against root trouble. And every Transite length is factory-tested for strength and uniformity. This adds up to low annual maintenance costs through the years.

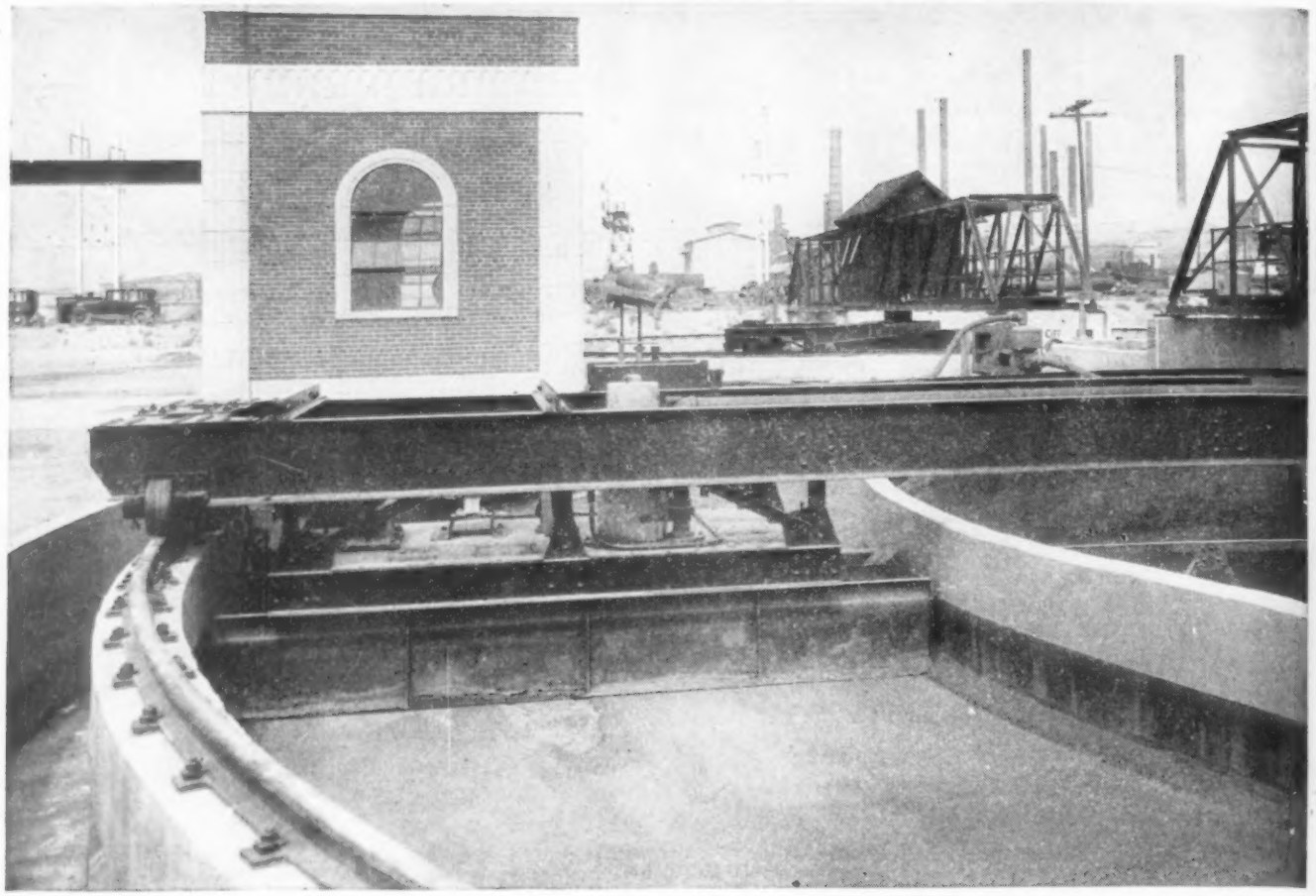
For Further Information. If you are seeking ways to lower sewage disposal costs, send for the Transite Sewer Pipe brochure. Write Johns-Manville, Box 290, New York 16, N. Y., for your copy.

*Reg. U. S. Pat. Off.

Johns-Manville

JOHNS-MANVILLE JM PRODUCTS

Transite Sewer Pipe



Magnetite Filter, built by Filtration Equipment Corporation, New York City, operating in an Eastern sewage treatment plant. Everdur Alloys used for cleaner housing, leveling blades, reinforcement bars and assembly bolts and nuts.

Where Industrial Wastes Complicate Corrosion Problems

CONSIDER EVERDUR*

EVERDUR COPPER-SILICON ALLOYS, noted for their versatility in sewage treatment equipment, are especially indicated where industrial wastes are mixed with domestic sewage.

Such combination systems present a problem of increased corrosion, with corroding elements that are variable in both character and intensity. The rustproof and highly corrosion resistant qualities of Everdur Alloys usually can be used to advantage under these conditions.

Everdur has been used in the sewage field since 1927 and has given satisfactory service in a wide variety of installations. Because of their high strength, durability and good fabricating qualities, Everdur Alloys lend themselves to the economical construction of wrought assemblies that are light in weight and easy to operate. For detailed information, write for Publications E-11 and E-5.

*Reg. U. S. Pat. Off. 48185

ANACONDA
from mine to consumer

Everdur

COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

North Platte, Nebraska, is using **Vitrified Clay Pipe** *to replace disintegrated pipe lines. It's the only pipe completely resistant to the corrosive action of gases, chemical wastes, rust and other disintegrating agents.*

Clay Pipe BOOSTS "LIFE EXPECTANCY" OF MUNICIPAL SEWER LINES

HUNDREDS of communities have found that *it pays to use the best* in sewerage installations. Thousands of dollars of taxpayers' money have gone "down the drain" for expensive maintenance and costly replacements for municipal disposal lines. That's why so many far-sighted city officials and industrial engineers are insisting on the use of Vitrified Clay Pipe to increase the "life expectancy" of municipal sewerage installations. They know that *there is no single instance on record where Clay Pipe has ever worn out.*

If you need specific information on a Clay Pipe problem, write the details to the office nearest you.

NATIONAL CLAY PIPE MANUFACTURERS, INC.
703 Ninth and Hill Building, Los Angeles 15, Calif.
1105 Huntington Bank Building, Columbus 15, Ohio
522 First National Bank Building, Atlanta 3, Ga.
100 N. LaSalle Street, Room 2100, Chicago 2, Ill.

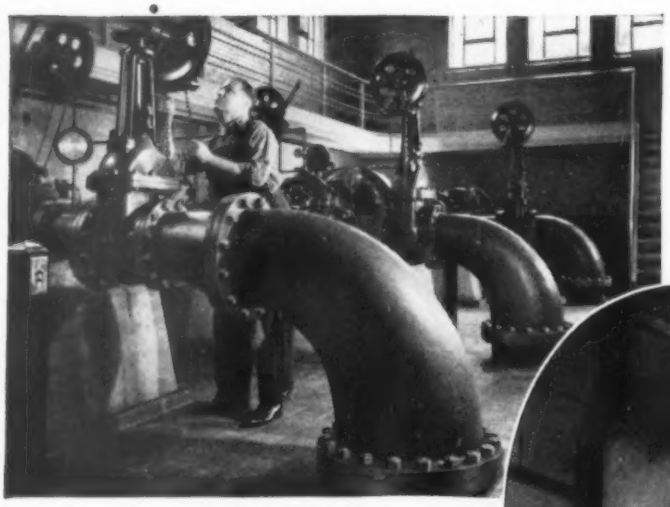
C-548-3

Vitrified

CLAY PIPE NEVER WEARS OUT!

CLAY PIPE

Crane Valves do more than control flow



A SUBURBAN VILLAGE *waterworks equips with Crane. Shown are Crane 10-in. gear and chain wheel operated gate valves on high lift pumps.*

A. W. W. A. GATE VALVES BY CRANE *are assurance of complete compliance with newest specifications, and of the best valve performance in their class. Pattern No. 2495, illustrated, double disc, outside screw and yoke, flanged ends, comes in 2 to 24-in. sizes. See Crane Catalog supplement 3A, page 126.*

In water and sewage plants the country over, Crane valves do more than just stop and start flow. By doing that job precisely, they safeguard public health. By giving unusually long and faithful service, they hold valve maintenance, repair and replacement costs to the lowest level.

To the men responsible for public water services, Crane valves assure peace of mind under all working conditions. Wouldn't you feel safer with valves and fittings having a reputation for dependability through more than 90 years?

CRANE CO., General Offices: 836 S. Michigan Avenue, Chicago 5, Illinois. *Nationwide Service Through Branches and Wholesalers.*

A LARGE CITY *pumping station specifies Crane quality valves—gates, globes, angles, checks—from the smallest to the 36-in. motor-operated control valves to mains.*

VALVES · FITTINGS · PIPE

CRANE

PLUMBING AND HEATING

Alhydro FLOC PRODUCER

PATENTS PENDING

FOR INDUSTRIAL OR MUNICIPAL WATER TREATMENT PLANTS

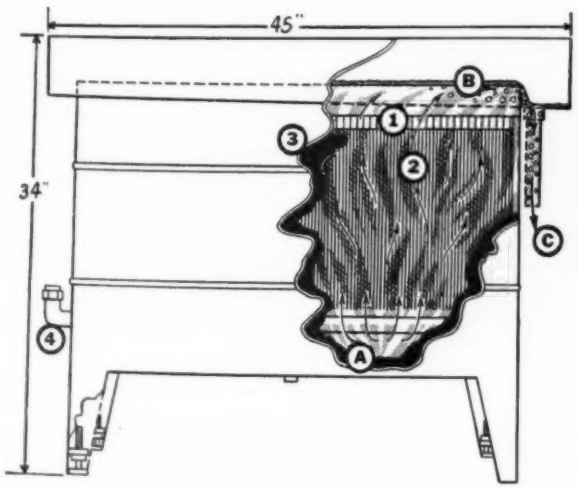
..."gives efficient floc formation even in cold, clear waters"

The amazing, new Alhydro Floc Producer is designed to produce floc efficiently and steadily at any temperature . . . even in extremely cold waters . . . and under a wide range of operating conditions. Thus, the Alhydro Floc Producer solves your cold weather—cold water problems.

The Alhydro method of producing concentrated aluminum hydroxide floc by low voltage electrolytic decomposition of easily replacable aluminum plates gives you many more advantages: instant control of floc concentration—floc production in any water pH from 4 to 12—a more stable floc that reforms immediately if broken up. And since 69 lbs. of aluminum Alhydro plates treat as much water as ¾ ton of coagulants, chemical storage is reduced to the minimum.

A single Alhydro unit measures only 45" x 13" x 34" and will treat an average of 300,000 gallons of water per day. The units may be installed singly or in multiples in existing or proposed water treatment plants.

Skillful engineering of the ALHYDRO FLOC PRODUCER gives simplicity of operation . . . ease of maintenance



1. Connector Bar on each side of tank.

2. Alternate Stainless Steel and Aluminum Plates.

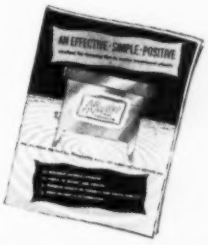
3. Composition Rubber Lined Stainless Steel Tank.

4. Water Feed Line easily removed for inspection.

A. Water enters tank through slots in feed pipe.

B. Concentrated floc is carried to top and leaves through discharge trough.

C. Discharge pipe feeds floc to raw water.



DESCRIPTIVE FOLDER—FREE

Read this folder which illustrates and describes the advantages of the compact Alhydro Floc Producer. See how you can simplify the treatment of drinking water or water for industrial use. Write for free copy today.

ALHYDRO, INC. (DEPARTMENT 9B) **516 N. CHARLES ST., BALTIMORE 1, MD.**

Over 91 years

OF PROGRESSIVE STORAGE TANK ENGINEERING!

Established in 1854, the R. D. Cole Mfg. Co. has long been recognized as one of the nation's outstanding tank builders. With over 90 years of "progressive storage tank experience" at your disposal, we will welcome the opportunity to serve your tank needs.

ALL SHAPES AND SIZES

The R. D. Cole Mfg. Co. has developed a complete line of elevated steel tanks for water supply, both for domestic service, and sprinkler requirements, ranging in capacity from 5,000 to 2,000,000 gallons. The designs include the standard Hemispherical and Self-supporting bottom, the "Cole Ovaloid", Standpipe, and many individual styles involving architectural treatment to satisfy local conditions, or to provide special shapes for advertising purposes.

STORAGE TANKS

Pressure tanks for storage of gas from digesters at sewage disposal plants so that excess output at peak loads can be used during off-peak periods. Chemical storage tanks, hot water storage tanks, tanks for bulk storage of oils and gas.

CONSTRUCTION FACILITIES

Fabricated steel plate—the R. D. Cole Mfg. Co. has a fully equipped plant for the fabrication of riveted or welded steel plate. In addition to the construction of its regular line of horizontal return tubular boilers, oil storage tanks, tubular heaters, etc., the company is prepared to construct special tanks and apparatus of any specified metal plate.

1,000,000-Gallon "Cole-Shallow Depth" Tank

Designs available for any service, made to your specifications or from our designs submitted by our own Engineering Department.

R. D. COLE MANUFACTURING CO.

Established in 1854

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For the number one . . HOT SPOT this plant chose . . BYERS WROUGHT IRON PIPE

Typical Digestor Heating Coil Installation

Elimination of excessive maintenance was a primary aim in designing the Ensley Sewage Disposal Plant in Jefferson County, Alabama. In the digestor heating coils, which are generally regarded as the most punishing service in an installation, as well as in the connecting lines, Byers Wrought Iron pipe was used.

CONFIRMED BY EXPERIENCE

Both past experience and present practice support the choice of wrought iron in this application. A review of the specifications in the most modern plants built in recent years shows that the choice of experienced designers is almost invariably Byers Wrought Iron. This is of course only one of dozens of varied uses, which include gas lines, rotary distributor arms, stirring mechanisms, air lines, under drains in filter beds, and raw sewage lines. The best guide in application is the nature of the service. If it is corrosive . . . wrought iron pipe is a candidate for first consideration.

WHY WROUGHT IRON LASTS

The outstanding endurance that has won wrought iron such widespread acceptance comes from the unique structure and composition of the material. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack. The fibers also help to anchor the initial protective scale, which shields the underlying metal.

HELPFUL HINTS AVAILABLE

Our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations", illustrates and describes several large disposal plants, and discusses the problems of corrosion encountered in numerous individual services. If you are now building or repairing a plant, you will find some helpful tips in this book. Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

In BOTH water supply and sewage Beckman pH control

Cuts treating costs... Saves chemicals... Increases efficiency

...IN WATER SUPPLY

In the main treating plant of the giant Metropolitan Water District of Southern California—a system capable of delivering a BILLION gallons of water per day across the entire state of California, and one of the largest water treating jobs in the world—the pH control equipment is 100% BECKMAN! In the mammoth treating plant where the water is softened and purified, Beckman Automatic pH Instruments control the pH of the liming process... of the carbonation process... and the pH of the final treated water. This 100% installation is notable tribute to the dependability of Beckman Equipment!

...IN SEWAGE TREATMENT

At its Stickney installation—world's largest sewage plant—the Sanitary District of Chicago tried Beckman pH Control on the chemical end of its sewage treating operations ...found that it not only saved time and chemicals, but increased plant efficiency and decreased operating costs so successfully that a second installation was ordered for its Calumet Plant to cut operating costs there. Recently it ordered a THIRD Beckman pH Installation for still another plant in its large municipal system. Clear-cut evidence like that tells its own story!

LARGE OR SMALL, *YOUR* PLANT CAN SAVE WITH BECKMAN pH CONTROL!

The Beckman Automatic pH Indicator—Continuously and automatically *indicates* pH, and operates standard *recording* and *control* equipment for fully automatic pH control. Ask for Bulletin 16!

The Beckman Industrial pH Meter—Ideal for portable plant and field use. Simple, rugged, accurate, and incorporates many unique operating features. Write for Bulletin 211

FREE! WHAT *EVERY* EXECUTIVE SHOULD KNOW ABOUT pH... simplifies the technicalities of modern pH control. Tells what is it, how it's used, where it fits into modern treating operations. Send for your free copy today!

Name_____

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Address_____

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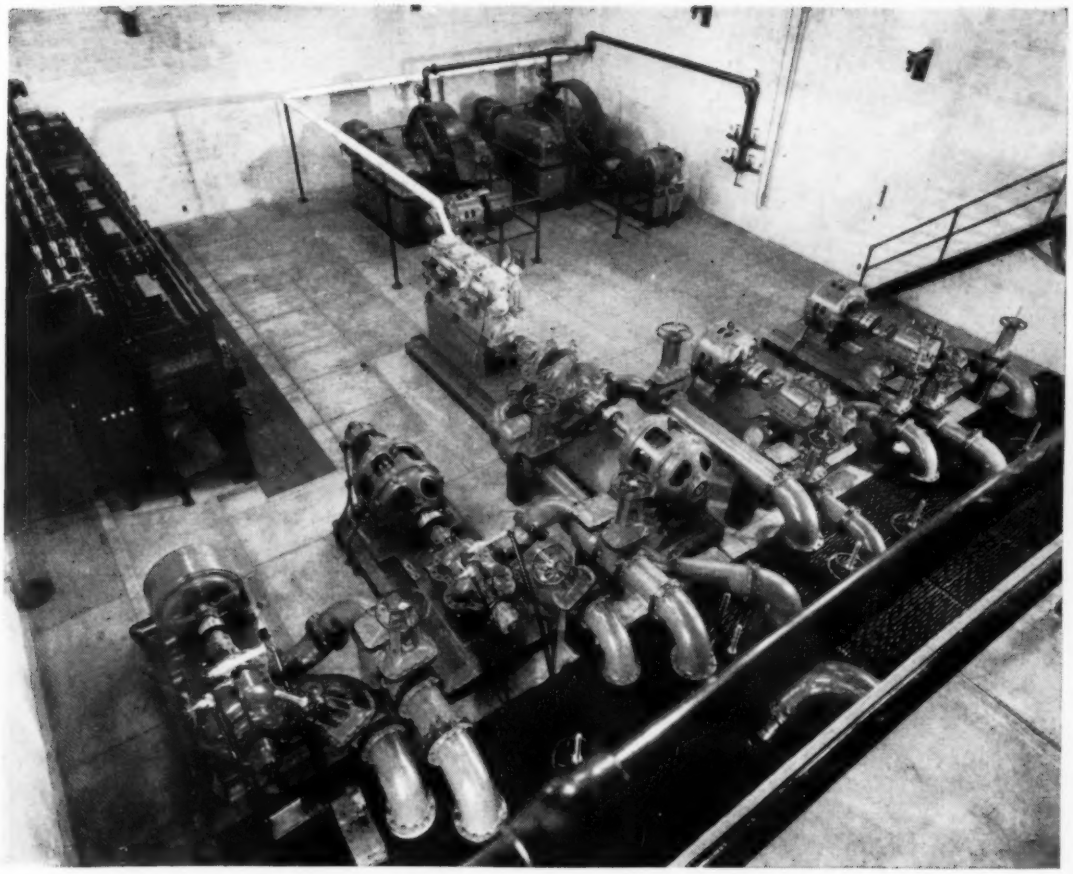
NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA 21, CALIFORNIA

Beckman THE LEADING NAME IN pH



Water Pumping Station, Fort Dodge, Iowa

IOWA GATE VALVES and CHECK VALVES

Specified for This Installation

Briefly, here is why you find "Iowa Valves" specified by Water Works Engineers, Superintendents and Operators of Water Treatment Plants, Pumping Stations and Distribution Systems, time after time after time: –

- **Recognized Design**
- **Quality of Materials**
- **Quality of Workmanship**
- **Prompt, Dependable Delivery**
- **35 Year history of satisfactory performance**

You are invited to fully acquaint yourself with current Iowa Valve developments and qualities. Write for completely illustrated, descriptive literature.

IOWA VALVE COMPANY

(Subsidiary of James B. Clow & Sons)

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DIXIE TANK AND BRIDGE CO.

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Complete Service for Elevated Water Tanks—

30 Years Experience

BE SAFE DON'T GAMBLE!

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress.

On completely re-conditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

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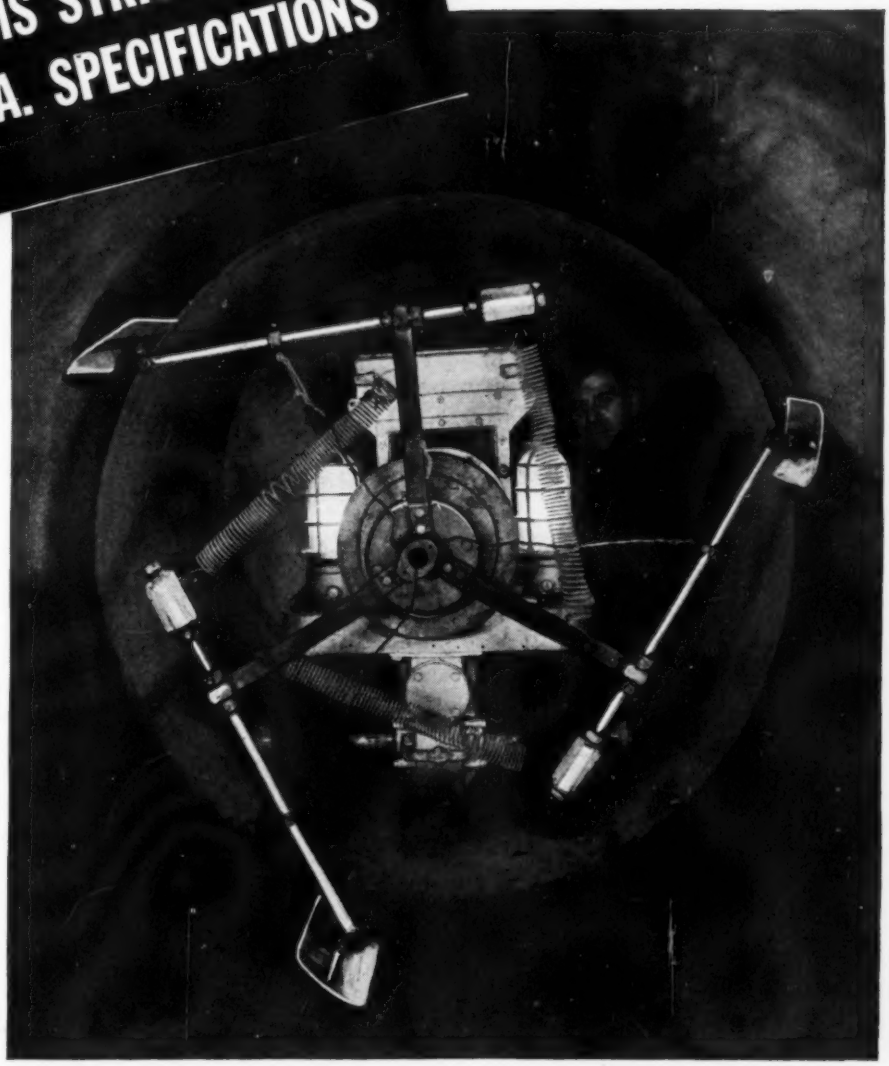
THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

CENTRILINE

CONFORMS STRICTLY WITH A.W.W.A. SPECIFICATIONS

▶▶▶ **PIPE LINING FACTS NO. 3**



▶▶▶▶ The Standard Specifications for cement-mortar protective coatings issued by the American Water Works Association provide: "Interior of the entire line, including both curves and tangents, shall be by centrifugal machine . . . the machine shall apply the mortar by centrifugal action without the use of compressed air and follow its application by automatic trowelling to a uniform thickness and smooth finished surface."

The strict adherence to these specifications by Centriline insures a continuous, dense, smooth lining, applied without rebound that means restored carrying capacity perpetually sustained and longer life to mains. If pipelines are losing efficiency it is time to consider Centrilining. Our engineers stand ready to assist you.

▶▶▶▶ **WRITE TODAY FOR THE NEW CENTRILINE CATALOG**

CENTRILINE CORPORATION

148 CEDAR STREET • NEW YORK 6, N. Y.

CENTRILINE PROCESS

CEMENT MORTAR LININGS FOR WATER MAINS

Centrifugally Applied

In Strict Conformity with A. W. W. A. Specifications

CAULKING LEAD

5 LB. CHAIN LINKS OR PIGS

NOW AVAILABLE

YOUR INQUIRIES INVITED

Established Producer & Supplier of Caulking Lead For the Water Works Industry—Now in Position to Make Reasonably Prompt Shipments

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Colonial Smelting and Refining Company, Inc.

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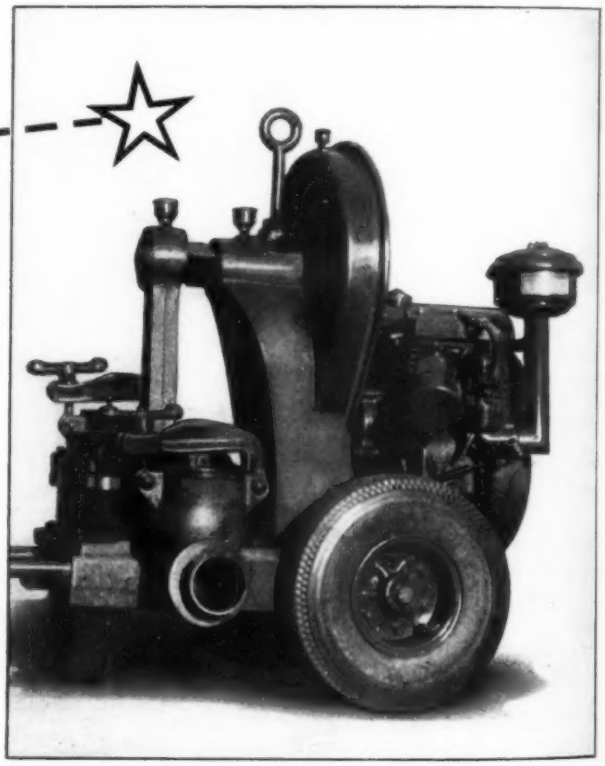
PRODUCERS OF HIGH QUALITY BRASS, BRONZE, ALUMINUM INGOTS SPECIAL ALLOYS—WHITE METALS

CARTER HUMDINGER DIAPHRAGM PUMPS



New and redesigned to give even more efficient service, the CARTER "Humdinger" diaphragm pump has been engineered to handle the toughest of dewatering problems. This new, relatively simple design embodies fewer wearable parts, which means less "time out" on the job.

With less "time out" the contractor is assured of greater savings and economy of operation, together with the reliability of a proven product.

Pumping reliability is a must in the contracting field—choose a "Humdinger" and you're guaranteed a unit that will pump any flowable substance!

● Write for Bulletin 4503

★ *OTHER EQUIPMENT* •

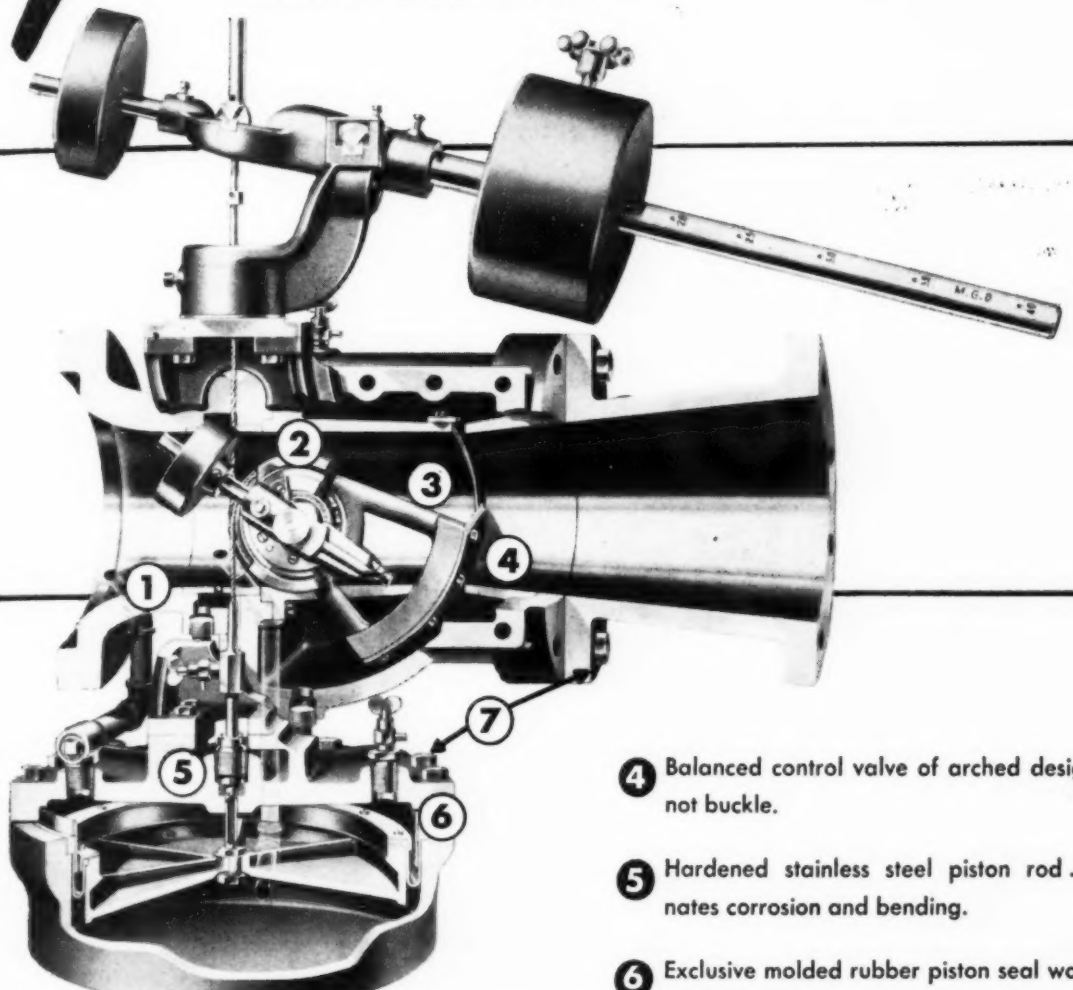
MIXING • FLOCCULATION • DIGESTERS • ALTERNATING SIPHONS • CLARIFIERS • ROTARY DISTRIBUTORS • SLUDGE PUMPS • SELF-PRIMING CENTRIFUGAL PUMPS • DIAPHRAGM PUMPS • PNEUMATIC EJECTORS

RALPH B. CARTER COMPANY

HACKENSACK, NEW JERSEY

7 GOOD REASONS

why more engineers, who demand the best in water works rate controllers, are specifying . . . "equal to Builders Model RCE":



1. Bronze throat with pressure-averaging chamber for greater accuracy.
2. Anti-friction bearings throughout: quick response to slightest change in flow.
3. Valve path entirely clear of air pockets — prevents "hunting".
4. Balanced control valve of arched design — will not buckle.
5. Hardened stainless steel piston rod . . . eliminates corrosion and bending.
6. Exclusive molded rubber piston seal won't bind, catch or reverse.
7. And something extra, — Everdur bronze bolts for easy maintenance.

For Bulletin 321B, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 10 Codding Street, Providence 1, R. I.

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Venturi, Propeloflo and Orifice Meters • Kennison Nozzles • Venturi Filter Controllers and Gauges • Conveyoflo Meters Type M and Flo-Watch Instruments • Wheeler Filter Bottoms • Master Controllers • Filter Operating Tables • Manometers Chronoflo Telemeters

BUILDERS PROVIDENCE

Instruments

CHEMICAL USERS' GUIDE To General Chemical Products for Treatment of Water, Sewage, and Industrial Wastes

PRODUCT	AVAILABLE FORMS	COMMERCIAL STRENGTH (MIN.)	SHIPPING CONTAINERS	APPLICATIONS
Aluminum Sulfate $Al_2(SO_4)_3 \cdot 14H_2O$ approx. *(Filter Alum)*	Commercial & Iron Free: Lump • Ground Powdered	17.25% Al_2O_3	Bags Barrels • Drums Bulk Carloads	Coagulant for water and sewage. Dewatering conditioner for sewage sludge. 1% Sol. pH 3.4.
Aqua Ammonia NH_4OH plus Water *(Ammonia Water)*	Colorless Liquid	26° Be. (29.4% NH_3)	Steel Drums Carboys	Used with chlorine to form chloramines for water disinfection.
Ammonium Aluminum Sulfate $Al_2(SO_4)_3 \cdot (NH_4)_2SO_4 \cdot 24H_2O$ *(Ammonia Alum) (Crystal Alum)*	Lump Nut Granular Powdered	11.2% Al_2O_3	Bags Fibre Drums	Coagulant for water. Advantageous for pressure filters. Supplies ammonia for chloramine formation. 1% Sol. pH 3.5.
Sodium Bisulfite, Anhydrous $Na_2S_2O_5$ *(ABS) (Sodium Metabisulfite)*	Powdered	97.5% $Na_2S_2O_5$ (Equiv. 65.5% SO_2)	Fibre Drums	Antichlor. Remove iron and manganese deposits from filter sand. 1% Sol. pH 4.6.
Sodium Silicate $Na_2O \cdot X(SiO_2)$ plus H_2O *(Water Glass) (Silicate of Soda)*	Viscous Liquid	38° to 52° Be. Various Ratios of $Na_2O:SiO_2$	Drums Tank Cars Tank Trucks	1. Aid in floc formation. 2. Prevent red water corrosion in distribution lines. 1% Sol. pH 12.7
Sodium Thiosulfate $Na_2S_2O_3 \cdot 5H_2O$ *(Hypo) (Sodium Hyposulfite)*	Crystals: Prismatic Rice Selected Universal Granular	99.75% $Na_2S_2O_3 \cdot 5H_2O$	Bags Barrels Fibre Drums	Antichlor. Water solution is neutral.
Sulfuric Acid H_2SO_4 plus H_2O *(Oil of Vitriol)*	Corrosive, oily liquid Various strengths	66° Be. (93.19% H_2SO_4)	Bottles Carboys Drums Tank Trucks Tank Cars	1. Reduce pH and alkalinity. 2. Regenerate carbaceous zeolites and ion exchangers. 3. Activate Baylis Silicate.
Potassium Aluminum Sulfate $Al_2(SO_4)_3 \cdot K_2SO_4 \cdot 24H_2O$ *(Potash Alum)*	Lump Nut Granular Powdered	10.7% Al_2O_3	Bags Fibre Drums	Coagulant for water. Slow, even rate of solubility desirable for solution pot feeders. 1% Sol. pH 3.52.
Sodium Sulfite, Anhydrous Na_2SO_3 *("Sulfite")*	Granular Powdered	98.5% Na_2SO_3	Bags Fibre Drums	Antichlor, oxygen remover. Weak solutions absorb oxygen readily. 1% Sol. pH 9.8.
Sodium Sulfate, Crystal $Na_2SO_4 \cdot 10H_2O$ *(Glauber's Salt)*	Crystal & Needle Crystal	96% $Na_2SO_4 \cdot 10H_2O$	Barrels Bags Drums	Neutral Solution. Boiler water treatment (maintenance of sulfate-carbonate ratio).
Sodium Sulfate, Anhydrous Na_2SO_4	Powdered	99.5% Na_2SO_4	Bags Barrels	Neutral Solution. Boiler water treatment (sulfate-carbonate ratio)
Trisodium Phosphate $Na_3PO_4 \cdot 12H_2O$ *(TSP)*	Crystal	98.5—103% $Na_3PO_4 \cdot 12H_2O$ (Equiv. 19% P_2O_5)	Bags Barrels Fibre Drums	Boiler water treatment. Cleaning compound. 1% Sol. pH 11.8-12.0.
Disodium Phosphate, Crystal $Na_2HPO_4 \cdot 12H_2O$	Crystal	98% $Na_2HPO_4 \cdot 12H_2O$ (Equiv. 19.5% P_2O_5)	Bags Barrels Fibre Drums	Boiler water. (Calcium and magnesium precipitation.) 1% Sol. pH 8.4.
Disodium Phosphate, Anhydrous Na_2HPO_4	Powdered Flake	96% Na_2HPO_4 (Equiv. 48% P_2O_5)	Same	Same as Crystal, but stronger product.
Sodium Fluoride NaF *(Fluoride)*	Powdered (white or blue colored: Nile Blue) Light or dense	90% and 95% NaF	Bags Barrels Fibre Drums	Fluorination of water supplies. (For information, consult with local health officers.)

FOR THE LABORATORY: Baker & Adamson Laboratory Reagents

For full information on these and other General Chemical products, write or phone the nearest office below.

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In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

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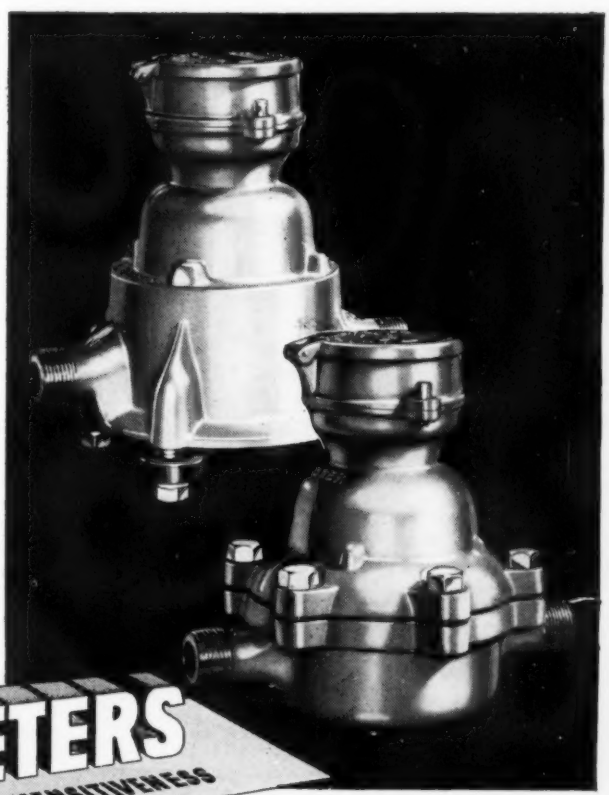
Put in service, 1921, and examined 1933; awarded business to Badger ever since

The engineer of a large southwestern city's Water Works wrote this: "A Badger Meter, in service since 1921, was removed for inspection. Examination indicated it was in excellent condition, with the exception of a part that was replaced at a cost of ten cents, and the meter returned to service."

Since then this city has bought Badger Meters. You, too, can depend on their durability, precision-construction, and sustained accuracy at lowest cost.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.



Every waterworks superintendent should have a copy of our new chart: "Table for Determining Service-Pipe and Meter Sizes", No. 676 (no charge).

BADGER METERS IN ALL PARTS OF THE WORLD

BADGER Water METERS

ACCURACY · LOW COST MAINTENANCE · DURABILITY · SENSITIVENESS

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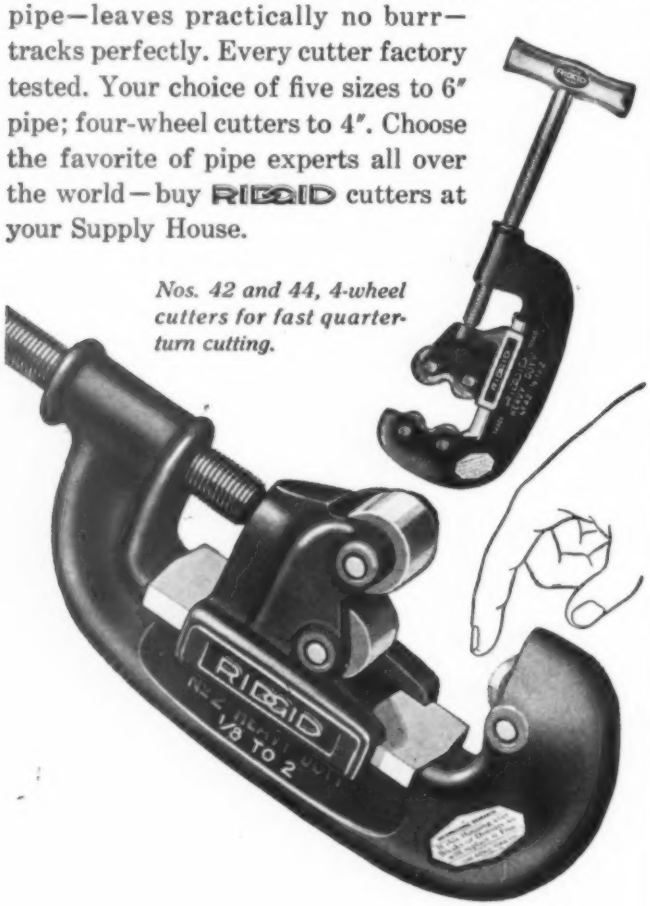
MORE QUICK CLEAN *Pipe Cuts* FOR YOUR MONEY

RIDGID Cutter with thin blade wheel rolls easily through all kinds of pipe

● It's a cinch to cut pipe extra fast with the new efficiency-balanced RIDGID cutter. Extra cutting power comes from the heat-treated tool-steel blade; tough and thin, it rolls easily through any kind of pipe—leaves practically no burr—tracks perfectly. Every cutter factory tested. Your choice of five sizes to 6″ pipe; four-wheel cutters to 4″. Choose the favorite of pipe experts all over the world—buy RIDGID cutters at your Supply House.



Nos. 42 and 44, 4-wheel cutters for fast quarter-turn cutting.

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- **YOUR WATER LOSS**
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WE CAN SHOW YOU

ENGINEERING SURVEY
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And now . . . A complete engineering service designed and planned to give you more information about your water supply and disposal problems than ever before available.

Pittsburgh Pipe Cleaner Company has added to their already efficient staff consulting engineers to aid and advise you in determining the condition and serviceability of your water supply mains—recommend the cleaning, repair, replacement, or expansion of these systems—to design, correct, repair, replace, and install new or additional pipe to give your system its highest efficiency.

Write **TODAY** for complete information on this type of survey of your problems.

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HERE'S A "PACKAGE" TREATMENT PLANT *that fits a modest budget*

MODERATE FIRST COST, HIGH DEGREE OF PURIFICATION AND EXCEPTIONALLY LOW OPERATING COST MAKE THIS DEPENDABLE UNIT IDEAL FOR SMALL COMMUNITIES UP TO 3500 PERSONS AND FOR ISOLATED PLANTS AND INSTITUTIONS

Many small communities and outlying plants, compelled on the one hand to purify wastes in order to stop pollution, but lacking ample supply of diluting water, have solved their seemingly insoluble diffculty by means of the Yeomans "Package" Aerifier activated sludge plant.

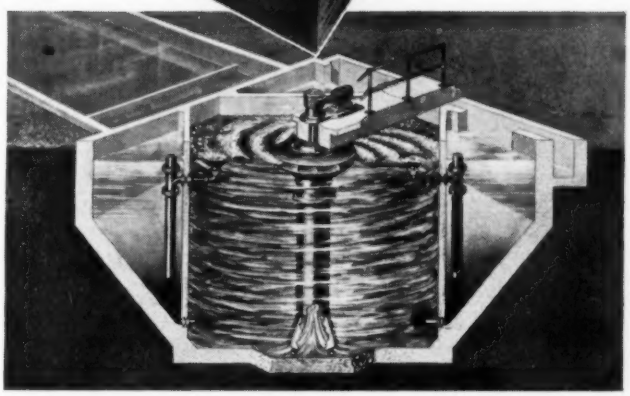
HIGH EFFICIENCY AT LOW COST

Here indeed is a highly efficient means of purification designed to fit the modest budget. In a single compact concrete unit of minimum dimensions you get aeration and final sedimentation; producing crystal-clear effluent at remarkably low over-all plant cost. Because there are no odors or flies, the plant can be located near habitation. Operation is simple, with supervision limited to routine check-up. All units are open for visual inspection. With its permanent concrete construction it is a plant that will perform efficiently for many years.

GOOD ENGINEERING

Each installation of the Yeomans Aerifier includes final adjustment, initial tested operation, thorough training of operators and continued counsel from an organization with a 50-year reputation for good engineering.

A Yeomans recommendation, based on data covering your needs, complete with construction cost estimates and application engineering, will be sent upon request.



Basic element of the "Aerifier" is the Yeomans "Spiralflo" mechanical aerator. Its essential parts are

- ***a stationary up-draft tube***
- ***a rotating aeration cone***
- ***an electrical and mechanical drive unit to rotate the cone***

By rotation of the cone, liquor is drawn up through the tube and thrown out in spiral waves—entraining air bubbles to permeate the entire content of the tank with oxygen. The tank content rotates gently, to preserve the floc and promote flocculation. Aeration is complete. There is no deposit of activated sludge on the tank bottom. Power consumption is low.

Other "Aerifier" parts are adjustable loading funnels, angular corner clarifier compartments, automatic return for activated sludge to the aeration tank, and automatic return of excess activated sludge to the primary tank.

These bulletins will be found most helpful—write for them:

"SPIRALFLO" AERATOR—a full description of this simple, highly efficient unit.
Bulletin 6601

"AERIFIER"—for activated sludge plants—a complete explanation of design, construction and operation principle.
Bulletin 6651

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FOR HANDLING AND TREATMENT OF DOMESTIC SEWAGE AND INDUSTRIAL WASTE, YEOMANS MANUFACTURES
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50 YEARS OF PUMP EXPERIENCE

Unit Responsibility

KEY TO MORE

. . . FROM INFLUENT TO EFFLUENT . . . IN PLANTS OF ANY SIZE

Regardless of the size or capacity of your plant, you can rely on Westinghouse for help in stepping up system efficiency. For Westinghouse produces dependable, installation-proved electrical equipment for co-ordinated drive and control of every process from influent to treated effluent.

Whether the drive requires ¼ hp or 5,000—50 motors or 500—Westinghouse can help you select and apply the right motor drive and control or any allied electrical equipment needed to improve your methods. Because Westinghouse can supply *all* of your electrical requirements, the expense and annoyance of piecemeal ordering are eliminated.

So today, as you plan modernization or extension of facilities, look to Westinghouse for the best in drive and control equipment regardless of the extent or nature of your needs. One supplier . . . one responsibility . . . one desired result: more efficient operation of every process from influent to effluent. Make Westinghouse your electrical partner at the planning board. For details call your Westinghouse office or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94747

OPERATING EFFICIENCY

"WESTINGHOUSE-EQUIPPED THROUGHOUT" MEANS SIMPLIFIED ORDERING, QUICKER INSTALLATION, MORE EFFICIENT OPERATION

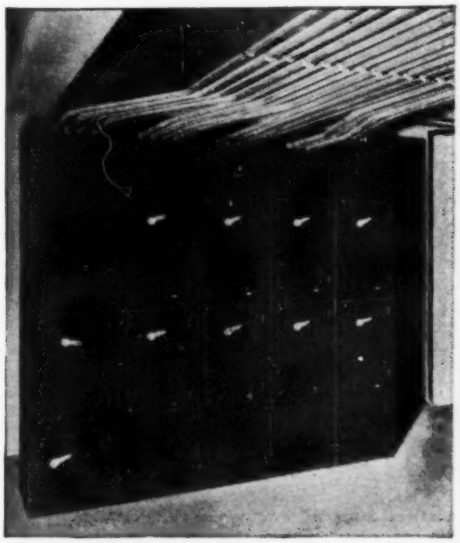
Putting power to work *productively* can be a major problem—or a simple one. When items must be selected, ordered and received from many sources, it means many chances for costly errors and delays . . . divided responsibility—or none at all—for performance of installed equipment.

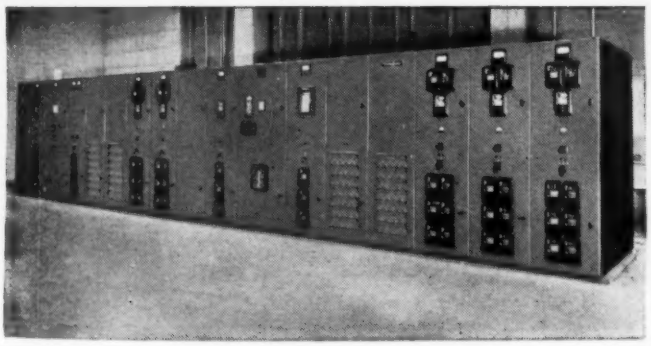
Westinghouse offers the way to simplify the job. From equipment for generation of electrical or steam power, to the most specialized types of drives and control for its utilization, Westinghouse provides a single source of supply . . . one broad pair of shoulders competent to take responsibility for performance of all parts of the job.

Here are a few of the places where Westinghouse unit responsibility prevents headaches . . . saves money . . . assures *more productive* power:

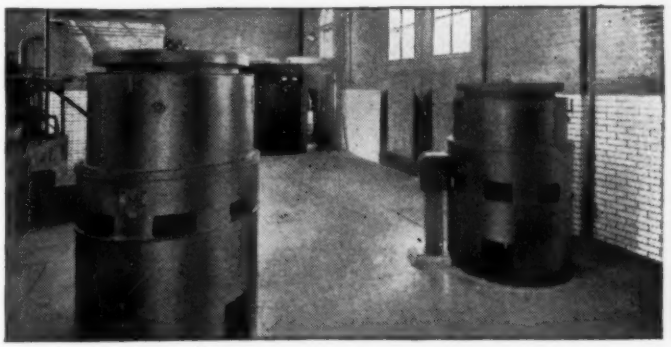
PANELBOARDS—Westinghouse control panelboard installed in a 9,000 gpm plant, including main incoming breaker, motor feeder breakers, lighting and auxiliary circuits; all in one attractive, easily installed unit.

CONTROL CENTERS—Typical Westinghouse Control Center which houses control for auxiliary motors at one centralized location—improves operating safety, simplifies operation and maintenance. Additional units can be added as needed.





SWITCHGEAR—Westinghouse Indoor Metal-clad Switchgear (2,300 volts) for feeder circuits to main pump motors. Factory assembled and tested to assure proper protection of vital equipment. Installed as a unit.



MOTORS—One 350/160 and one 250/100 hp two-speed Westinghouse CS Motors driving main sewage disposal pumps. (Metal-clad control panel in background.) These motors use low speed and low hp for normal sewage flow. High speed and high hp increase pumping capacity 300 percent for handling emergency conditions.

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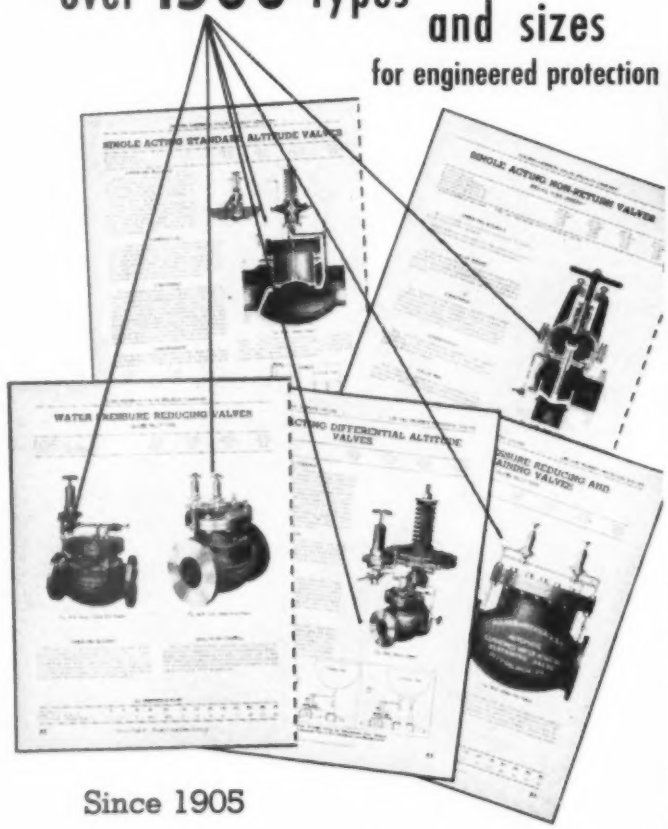

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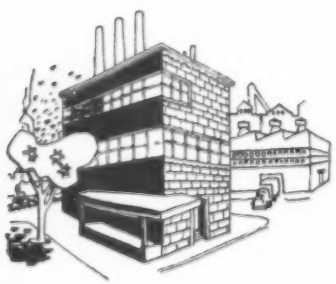

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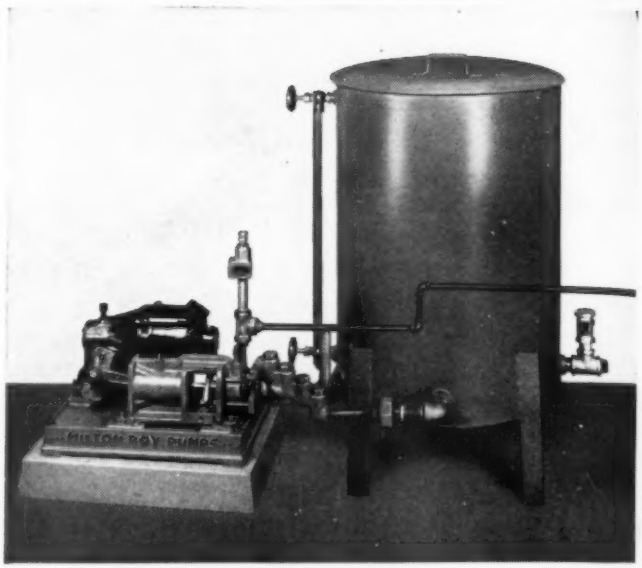
MILTON Roy CHEMICAL PUMPS

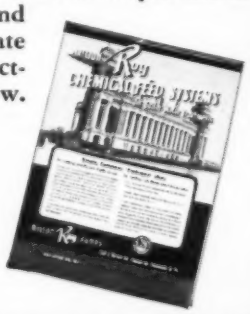


Complete Feed Systems for Boiler Water Chemical Treatment

Milton Roy "Packaged" Units for chemically treating boiler water are available to feed sodium sulfite into the suction side of the feed water pump and to feed other chemicals, such as phosphates, soda ash and caustic directly into each boiler. Both methods are usually recommended for the correct treatment of boiler water.

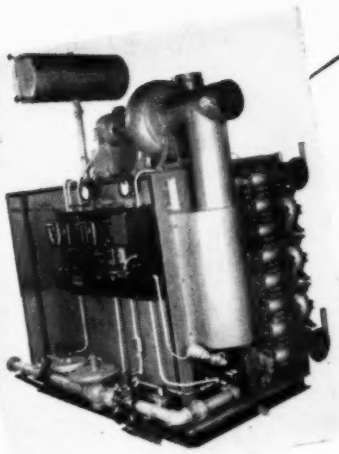
- TO REMOVE DISSOLVED OXYGEN, INSURE AGAINST CORROSION AND PREVENT PITTING.
- TO PREVENT SCALE FORMATIONS, CONTROL ALKALINITY AND PREVENT EMBRITTLEMENT.

Units are complete with Milton Roy Pumps, tanks, gages, low-level pump cutouts and alarms . . . are available in a wide range of capacities to meet all requirements. Complete electronic controls and meters can be supplied to operate pumps automatically at rates directly proportional to feed water flow.



Write for Bulletin 451 also Technical Paper 51 "What the Power Engineer Needs to Know About Chemical Feed Systems for Water Treatment."

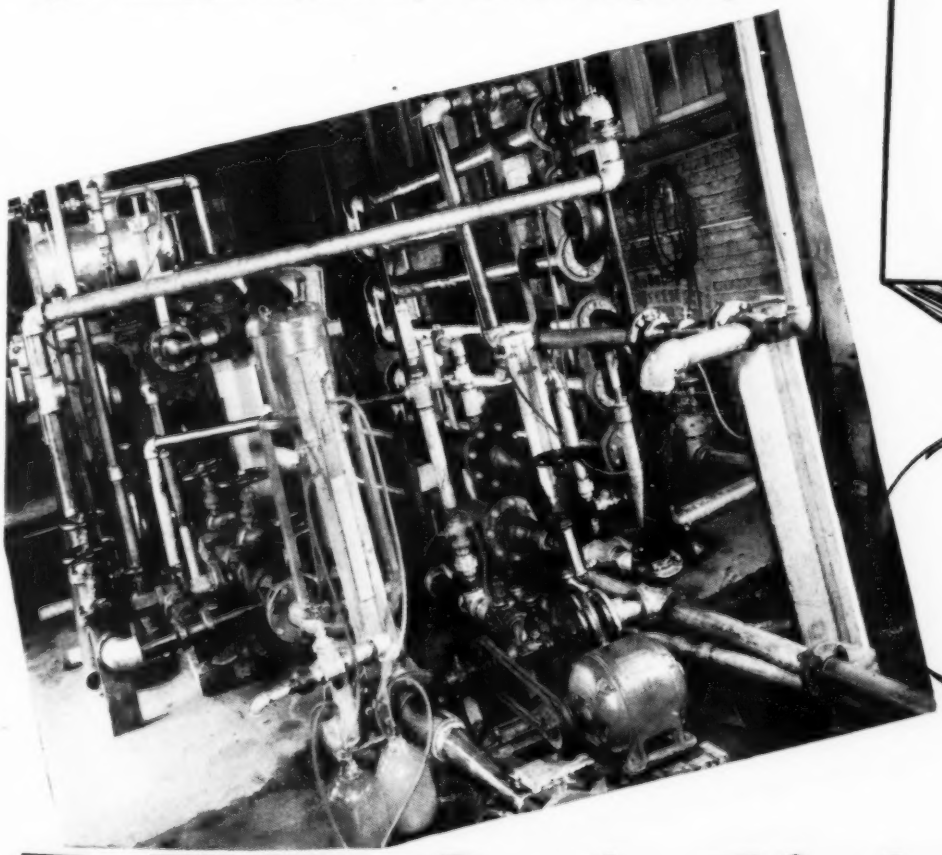
MILTON Roy COMPANY
1329 E. MERMAID LANE. CHESTNUT HILL. PHILA. 18. PA.



One of two No. 750 Heater and Heat Exchanger Units for Lamberts Point Plant, Norfolk, Virginia. Aldrich and Buck, New York, N. Y., Engineers.

WHO SHOULD BE THE GUINEA PIG ON NEW EQUIPMENT?

One year of extensive experiments in external heating BEFORE placing a single new Digester Heater and Heat Exchanger unit in operation —that's the Pacific Flush-Tank Company's answer to the question. In its customary role of "guinea pig," P.F.T. kept the experimental layout shown below in operation 5 and 6 days a week during 1944 and 1945 to determine heat transfer and loss of head. To gather reliable and empirical data on sludges to be encountered, different types of sludges were brought in from representative sewage treatment plants and used in the test work. The result: more than 55 completely successful installations already. Another 55 are on order and in process of fabrication. The unit above is arranged for automatic gas and oil firing, automatic digester temperature maintenance, automatic building heating, and has complete flame safety protection. Normal output: 750,000 B.t.u. per hour for digester heating plus 375,000 B.t.u. per hour for building heating.



P.F.T *Pacific Flush-Tank Co.*

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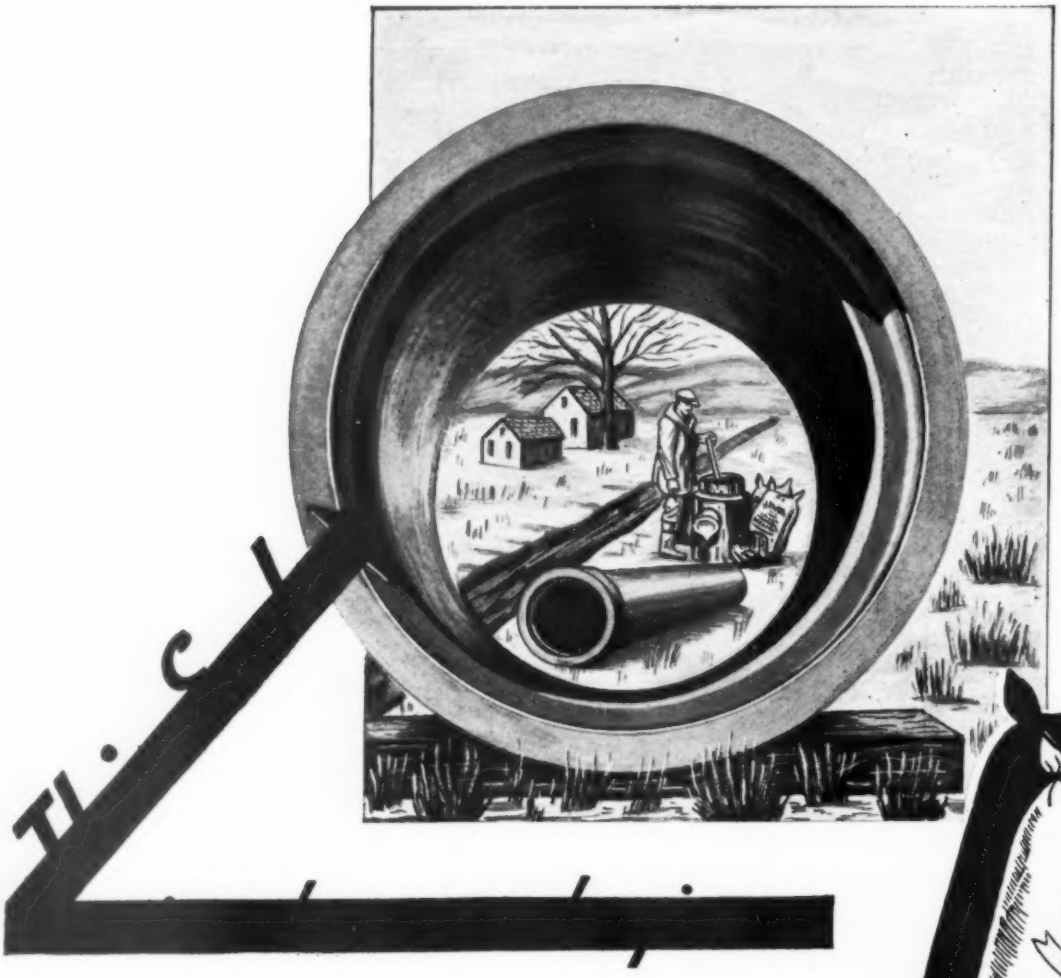

DOWN through the years the development of cast iron bell and spigot pipe has resulted in a product that can unquestionably last for a century or more. The jointing compound used should naturally be a matter of deep concern. HYDROTITE, time tested and proven for over 30 years, is the one jointing compound you know you can rely on. Self-caulking, self-sealing HYDROTITE costs less to buy and use, requires minimum of unskilled labor, makes tighter joints and withstands the effects of vibration and time. Used with FIBREX, a bacteria free, easy to use packing, it makes an unbeatable water tight joint.

Always use FIBREX, the sanitary, bacteria-free packing that costs about 30% less than braided jute. Sample on request.

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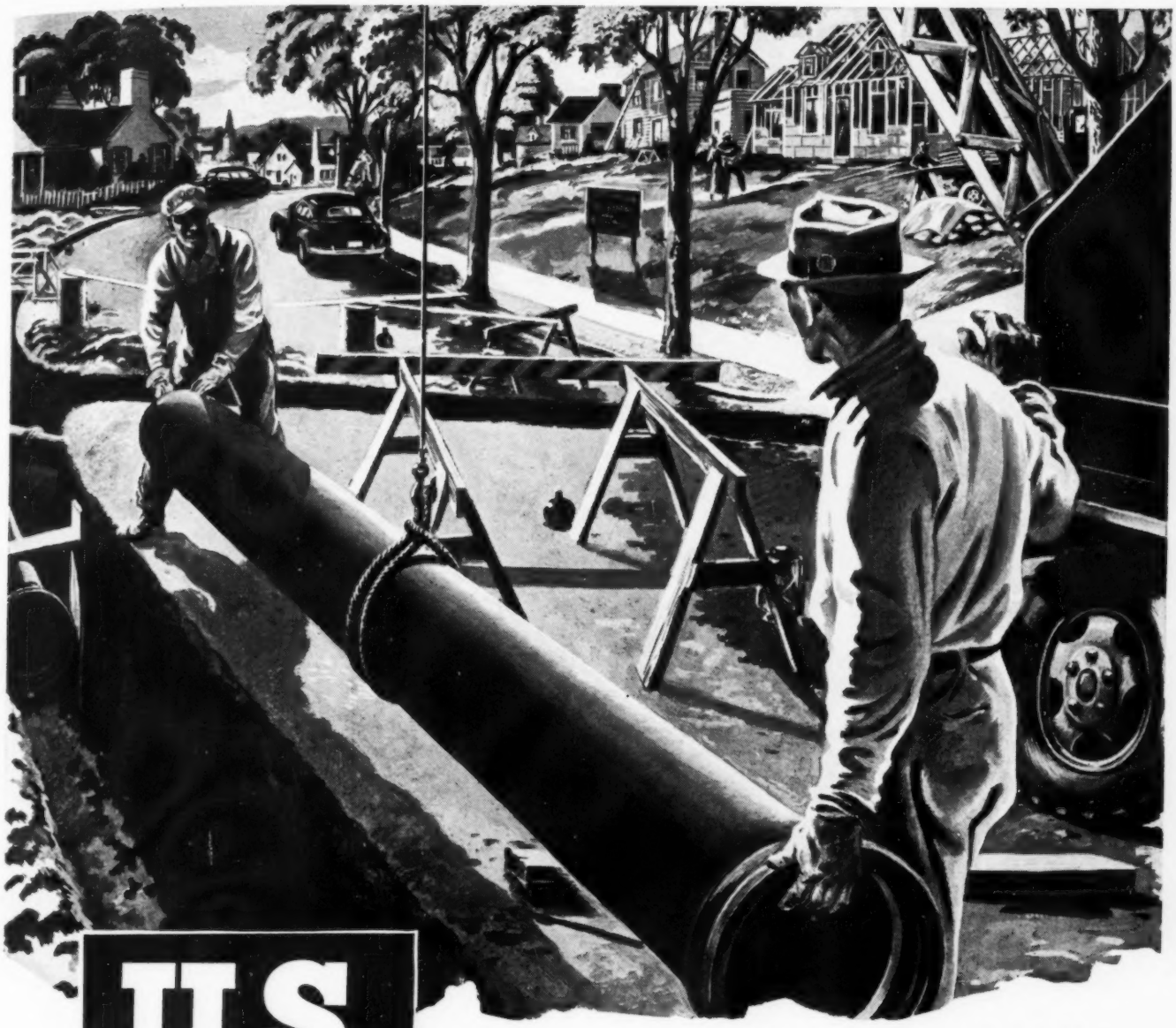
Plant at WEST MEDFORD, BOSTON, MASS.



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Reports received from various sections of the country indicate substantial progress towards the goals set for new dwelling units to meet an unprecedented national need. As a large manufacturer of cast iron pressure pipe we are co-operating in this gigantic undertaking in full realization of the fact that new housing is not available for occupancy until served by water, gas and sewerage utilities. Our several foundries are producing cast iron pipe and fittings to the maximum that is possible with available raw materials. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey. Plants and Sales Offices Throughout U.S.A.**

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A new photoelectric instrument of high accuracy for the measurement of color and turbidity, as well as for all analytical colorimetric tests in the examination of water and sewage.

- Turbidity tests in terms of APHA (ppm) scale.
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NAME .....

STREET .....

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300,000-GALLON ELEVATED TANK improves water system of North St. Paul

We recently erected the Horton elevated tank shown at the left at North St. Paul, Minnesota, to provide gravity water pressure throughout the water distribution system. It has a capacity of 300,000 gals. and is 125 ft. to bottom.

The installation of an elevated storage tank is often the first step taken to increase the capacity of a water system, and to generally improve a city's water service. Experience in other cities has shown that there are several advantages which North St. Paul can expect to gain from the new tank. The gravity water pressure will help the pumping equipment to meet peak loads, and to maintain uniform pressure in the mains regardless of variations in the rate of consumption. This tank can also reduce pumping costs because it can be filled when power costs are lowest. As a system safeguard, the tank will be ready to supply water during emergencies or during power failures. In addition, similar municipal elevated tank installations have usually been responsible for lower insurance rates.

If your community is planning to obtain the benefits of elevated storage, let us give you full information and estimating figures.

Welded Construction

Welding is used exclusively in the construction of Horton tanks. There are no rivets, no caulking, and no leakage. The smooth surfaces and simple details of these tanks are easily cleaned and painted, and there are no corners to collect dirt which invites corrosion.

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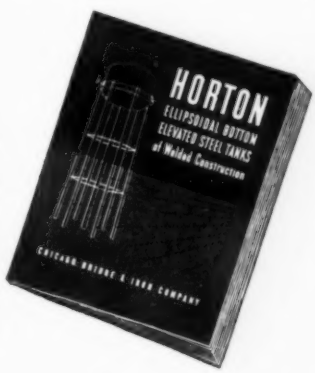

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WATER & SEWAGE WORKS

VOL. 95, NO. 9 SEPTEMBER, 1948

A Gillette Publication

"A MACHINE OF 101 USES"

Otherwise Known as the "Payloader"

by
ROGER W. ESTY
Superintendent
WATER & SEWER BOARD
DANVERS, MASS.

IN our type of work, water works and sewer construction, there is usually always a lot of surplus material to be picked up and hauled away. Loading by hand is very slow and expensive.

For many years, there has been a real need for some kind of multi-purpose machine that could be used for loading trucks, backfilling, earth-moving in general, and picking up heavy materials. Something not too large, not too heavy, not too slow, something agile and readily maneuverable but sturdy.

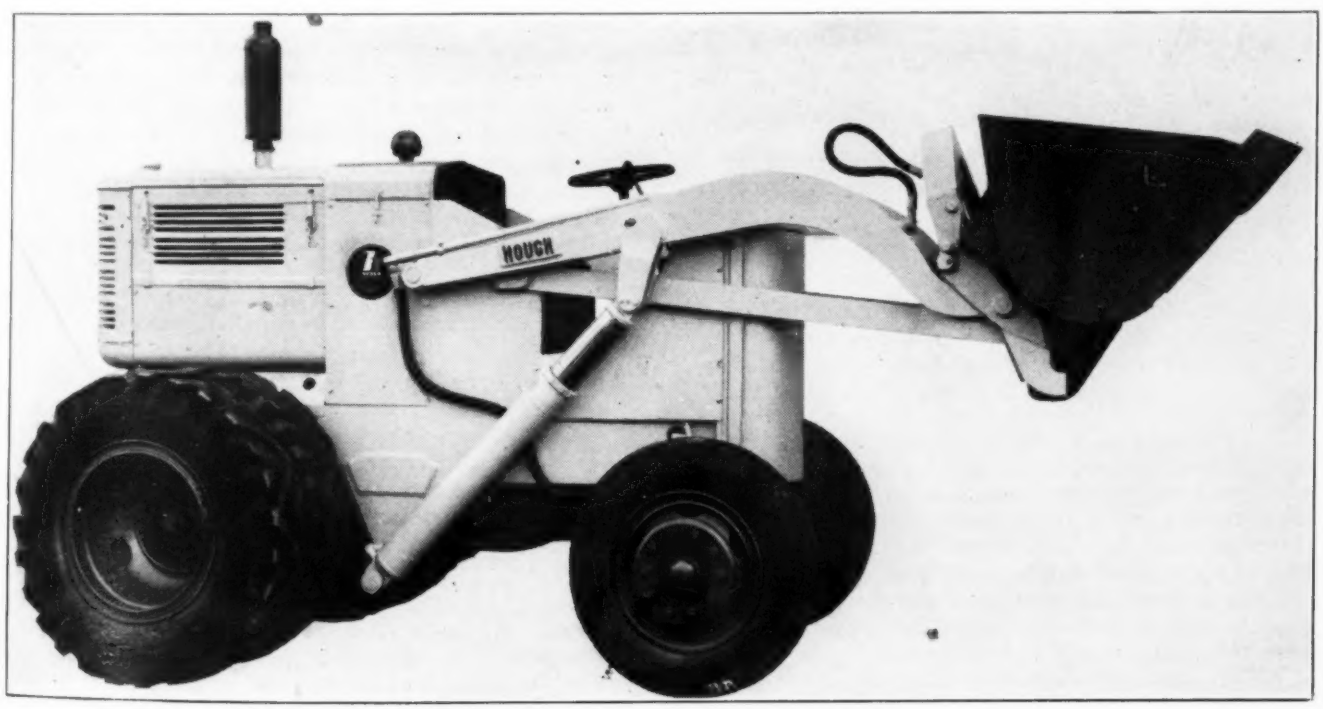
In looking around for some such machine, we found several cities and contractors using the Hough "Payloader." From our observations of this machine and similar machines, we came to the conclusion that the "Payloader" was the outstanding machine, and that it was the machine for our work.

The Author

We immediately negotiated for one, and it has exceeded our fondest expectations in every respect. It has proven so valuable to us in our construction work that even as small as is the Danvers Water and Sewer System, our men have said that we should have two.

Features of the Machine

The Hough "Payloader" is a large heavy-duty, all-purpose shovel designed for the excavation and loading of earth or other bulk materials. It has been designed from the



The Hough "Payloader"—Model HL-A
(Photo by courtesy of The Frank G. Hough Co.)

"Payloader" With Crane Attachment Handling 24-inch Transite Sewer Pipe.

(1) Unloading pipe from freight car.
(2) Placing on trailer which is hauled by "Payloader" for—
(3) Unloading and stacking along sewer right of way.
(Later the "Payloader" will drop bedding gravel into the trench, lower the pipe, back-fill trench, pull the sheathing where used, and remove surplus dirt, rock, etc.)

ground up as a complete unit. It is built with a low center of gravity for greater stability and better balance, both while digging and traveling. The high thrust point of the digging arms transfers additional weight on the rear wheels for better traction and more digging power. Big dual-tired rear wheels increase tractive power, while the large front wheels assure easy riding and steering.

Extremely short turning radius and ease of control makes the "Payloader" highly maneuverable in congested areas. The short wheel base and sharp steering angle further facilitates maneuvering. Its mobility is one of it real valued features. Open road speeds are up to 19 miles per hour. Moving from job to job takes very little time. It has powerful hydraulic brakes that assure safety at all times.

Full visibility is a real feature as the drivers seat is just beyond the center of the machine and the seat is high enough so that the operator can look down on the work. It is unlike most other machines in this respect, as such machines usually have the seat in the rear and low, and it is nearly impossible for the operator to see what he is doing. Good visibility minimizes the possibilities of accidents and speeds up the operation of the machine.

The model HL-A Hough "Payloader" that we have has a one yard bucket. It is 60 inches wide. It will hold 1 yard when filled level and 1¼ yards when heaped. It has a lifting weight capacity of 5000 pounds and will raise the bucket up to 12 ft. above ground. It takes 10 seconds for raising to full height and only 6 seconds to lower.

The overall length of the machine with bucket in carrying position is 10 ft. 6 in. and the overall height is 8 ft. 5½ in. It is 7 ft. 11 in. wide. The rear tires are 1200 x 24, 8 ply and the front tires are 825 x 20, 10 ply. The rear tires are filled with calcium chloride solution.

Our machine has an International four cylinder gasoline motor. The bore and stroke is 4.4 x 5.5, 1400 rpm. with a rated H. P. at this speed of 55.

The "Payloader" has 4 speeds forward and 1 reverse. It has high and low range speeds varying from 2.95 to 19 miles per hour.

It has a draw bar pull of 7000 pounds and weighs 13,200 pounds. Our machine cost us approximately $5,700 in 1947.

Recent Improvements

Many improvements are coming out from time to time. We plan to incorporate some of these into our machine, such as a hydraulic control which regulates the dumping of the bucket, hydraulic steering, and an additional weight block for the rear to afford more weight for better traction. These installations will cost us about $850.

The above is a brief description of this wonderful and powerful machine. When we bought this machine, we purchased only two attachments—namely, the bulldozing blade and crane. We use the crane attachment quite often, but seldom use the blade because we have a Bulldozer. The bucket in the down position will do all of the bulldozing work which we ordinarily have need of and do it much better.

Without any question, it is the most valuable and generally useful piece of equipment that a contractor or a public utility can own. I have consulted several that use this machine and they all say the same thing. How we ever got along without some such device, and still got our work done, is now beyond me.

I had a neighbor superintendent of a Water and Sewer Department ask me if I had to make a choice between purchasing a bulldozer and a Hough "Payloader" for his type of work, which would I select. I told him, by all means, purchase the "Payloader." He purchased one and is "tickled to death" with it, as the old expression goes.

When I advised my friend to purchase the "Payloader," I did not mean to leave the impression that the tractor bulldozer is now obsolete. It was because he could only have one unit that I advised purchase of the "Payloader." We have an HDW 7 Allis Chalmers Bulldozer and have use for it every day in our work. Each machine has its place and in our type of water and sewer construction, we can use both. Last year, we even hired an extra bulldozer. We are constructing a sewer system and we have about $60,000 worth of equipment. Maybe this explains why a small town like Danvers (population 14,700) can have and afford so much equipment. We are really in the contracting business, since we are constructing a $1,500,000 sewer system at this time.

In these modern times, rubber tired equipment has revolutionized the construction field. Shovels, backhoes, graders, bulldozers are all coming out on rubber. This provides instant mobility and saves slow, costly moving by trailers.

Some Uses for the "Payloader"

This Hough "Payloader" is used for a great many things. We purchased it primarily to clean up the surplus dirt from our trench work and to aid in our backfilling. It doesn't take long to fill a truck. I have timed the filling of a Reo dump-truck after which we weighed it. It took 5 minutes to load it and it weighed 16,880 pounds. This was a case of filling the truck from surplus material along the line of the trench.

In cleaning up the surplus and backfilling with this machine, no damage is done to the road. This is due to the rubber tires. Even with special plates on the track of our bulldozer, the road is damaged, somewhat, particularly the oil surfaced roads. Very little damage, if any, is caused to the macadam type of road by the tractor-bulldozer.

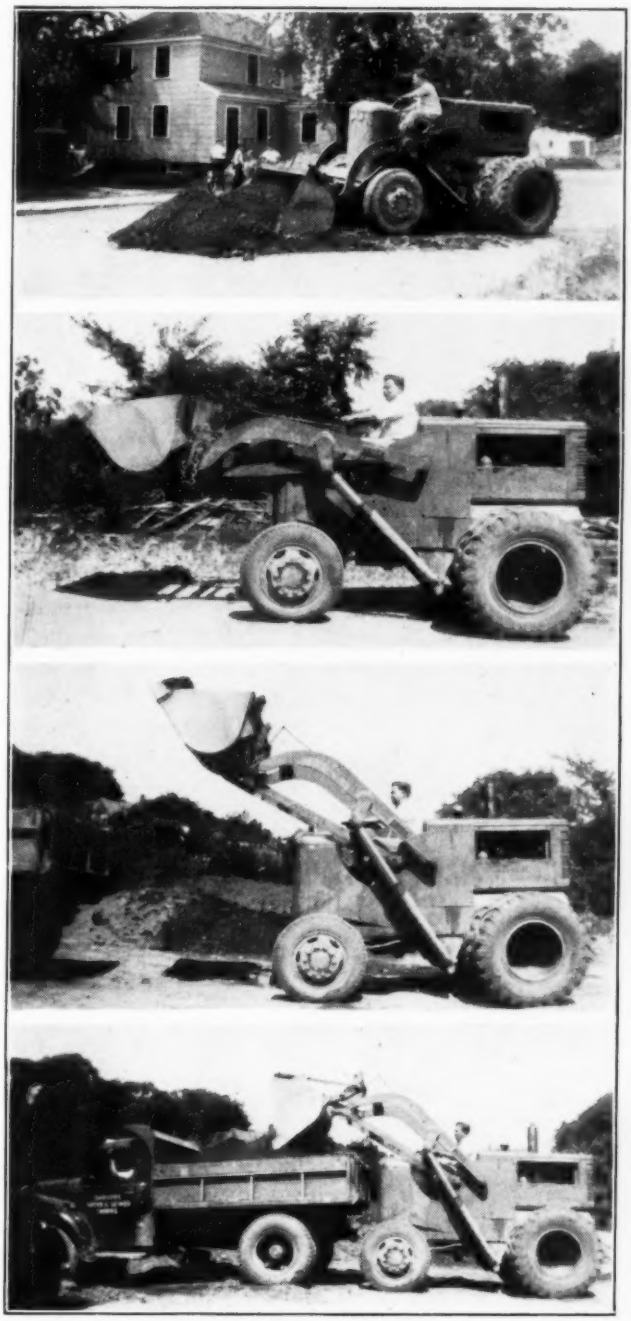
When a trench is sheathed, it is always a slow and hard job to pull the planking when the trench has been partially filled. All planking is easily pulled by the "Payloader," simetimes 3 to 6 planks at a time.

Instead of using a truck to haul cement, sand, and bricks from the stock piles or yards to the job this is sometimes done by the "Payloader."

In laying sewer pipe, we partially cradle all of our pipe work with screened gravel, a stone not over 1 inch in diameter. This stone is moved from stock piles along the road to the trench by the "Payloader" and dumped in as needed. This is much faster and less expensive than moving it by manpower and wheelbarrows.

It is particularly valuable around boulders and ledge work. Broken ledge, as thrown up and piled along the trench, is one of the hardest of materials to handle. On our ledge work this year, all of this material was scraped up and scooped up by the "Payloader" and loaded into dump trucks. This is one place where big labor savings can be made. Boulders of a half-yard or more are lifted up and loaded into trucks. The blasting logs, as chained together, are picked up out of the hole as a bundle, and moved away from the trench and brought back later when another charge is ready to be covered.

We laid considerable 24 in. "Transite" sewer pipe in 1947. A great deal of this was handled by the Hough "Payloader." A length of 24 in. "Transite" sewer pipe weighs 1100 pounds. Last year we had



"Payloader" in Action

(1) Scooping up surplus material in 1 yd. bucket.
(2) On the move at 8 to 19 miles per hour.
(3) Moving up to dump load into truck.
(4) Trigger-pull, and that's that.
(Note high visibility afforded operator.)

a carload of 35 lengths of this pipe come in. Using the "Payloader" with crane attachment we unloaded the pipe from the car and placed it on our trailer. We placed 17 lengths on one load and 18 lengths on the second load. We had to haul it 4/5 of a mile, where we stacked it along side of the road. We started at 7 o'clock and at 11:15 it was all unloaded, distributed, and the trailer was back in the yard.

We recently had 3 lengths of 60 in. heavy-duty concrete pipe to load and haul 8 miles, and place it back on the elevated ramp of the stock yard of the concern from which we purchased it. As the machine is rated for 5000 pounds, and as the pipe weighed 5900 pounds, we were a bit nervous about

Snow and Lots of It

*(1) Residence of the Author.**
(2) "Payloader" a life-saver in 1948's snow falls totalling a neat 12 feet.
(3) Making short shrift of 150 pine logs.
*(*As seen by Ye Ed. in Feby. 1948.)*

it when we attempted to lift it up and place it on the trailer, and in unloading and lifting it up 4 ft. to the ramp. From all appearances, the "Payloader" handled it very easily and without too much effort.

It is used sometimes one half day at a time in backfilling our main sewer trenches and the rest of the day going from job to job filling in water and sewer service trenches.

A Typical Day's Work

The following is a typical day's work of the Hough "Payloader" as taken from the time slips of the operator on July 22.

The machine was taken out of the garage and driven out to our gas tank and filled up for the day. The "Payloader" uses from 7 to 15 gallons of gasoline per day. It then went out to the yard and picked up a bucket full of sand from the stock pile. He then drove over to a stock shed in our yard and loaded on 12 bags of cement. He then drove about ½ mile to the job and left this material at the location of a manhole that was going to be built that day. This operation took ½ hour.

He then drove to another job about ½ mile away and backfilled four water service trenches and picked up the surplus clay material and loaded it onto a dump-truck and hauled it away. He spent ½ hour each on three jobs and 1 hour on the fourth. Total 2½ hours.

He then drove a half mile to a third job where they were laying house sewer pipe lines. On this job he backfilled two sewer services with gravel and then loaded the clay that had been excavated onto a dump-truck to be hauled away. It took about 1 hour for each job or a total of 2 hours.

He then went around the corner to another street and loaded some surplus material and filled in one trench with gravel that had been dumped along-side of the trench. It took ½ hour each on these two jobs or a total of 1 hour.

He then drove about ¾ of a mile back to the main sewer job where he had delivered the sand and cement in the morning. On a side street he spent

Odd Jobs

(1) Handling 60 in. concrete pipe weighing 5900 lbs. each made us nervous, since our "Payloader" was only guaranteed to lift 5000 lbs.
(2) Pulling trench sheathing, 3 to 6 planks at a time, is no trick at all for the "Payloader."
(3) "Handy-Andy" always ready to pull, or push anything. This time it's the mobile air compressor—another unit of 101 uses in the Water and Sewer Dept., including testing new "Transite" sewer joints for tightness under 15 lbs. air pressure, emptying water mains, operating and lubricating valves, etc., etc.

a half hour backfilling around a manhole, and loaded up the surplus material. Total time ½ hour.

The next 1½ hours he spent backfilling the main sewer trench. This trench was dug by one of our two trenching machines and is 27 in. wide and 8 ft. deep. Total time 1½ hours.

He then left the job and drove to the freight house and picked up some boxes of fittings that just filled the scoop bucket. He took these to our main storage shed and unloaded them and then put the machine up for the day. Total time ½ hour. Grand total 8½ hours.

Hours Reduced to Minutes

It only takes minutes for one man to fill in a service trench 25 ft. long with the "Payloader," as compared to hours for one man to backfill it manually.

It is interesting to listen to the different men in charge of the various jobs talking to the operator of the "Payloader" at the shop yard just before they go back to the afternoon's work.

One man will want it down at his job the first thing, another wants it over on his job at 2:30 and a third says, "if you can get over to my job at 4 o'clock we can get our service trench all filled up, rolled, and the surplus pushed to one side, before quitting time at 4:30."

This past winter, we had about 150 pine logs to get out of the woods and haul to the saw mill. We dragged them out of the woods to the edge of the road with a small tractor and then picked them up, 1 to 4 at a time, with the "Payloader" and placed them on the truck. Some of the logs were 16 ft. long and 20 inches in diameter. This provided a speedy, easy, and economical way of handling logs.

As much as possible all of our backfilling is done with machines. This gives us an opportunity to keep the manpower at work preparing trenches and laying pipe.

Life-Saver in Heavy Snows of Last Winter

During the past winter, we had the greatest amount of accumulated snow on record. We had approximately 12 ft. total snowfall, and at times we had between 5 ft. and 6 ft. on the level. We cleaned out our shop yard and loaded the snow onto trucks and hauled it away.

The Highway Department, in pushing back the snow with their large grader plow, would pile it up 8 ft. high, covering our hydrants to such an extent that it was a difficult, slow, and expensive job to hand-shovel the snow away from the hydrant. In five minutes, the "Payloader" would clean all of the snow from an area large enough to run a fire engine right in alongside the hydrant.

We use the "Payloader" to haul our cement mixer, trailer compressor, pumps, welding-machine, and even our big trailer to haul pipe on, or even our small trenching machine to a job.

There are probably many other things that the "Payloader" can be used for in our own type work that I have failed to find out as yet, or have possibly forgotten to state.

Those usages that I have mentioned are the most important and the most common everyday uses. It is without any doubt or exceptions the most valuable and versatile piece of equipment of the 27 pieces of equipment that we are fortunate enough to own.

This article has been prepared by Mr. Esty at the request of the Editor who, having spent a busy day in Danvers trying to keep up with the author, saw some of the variety of uses to which the Hough "Payloader" was being put, not the least impressive being the rapidity with which snow was being removed at various locations.

So impressed with the versatility of the "Payloader" was the writer that he prevailed upon Mr. Esty to tell our readers about this indispensable "Machine of 101 Uses."—L. H. E.

Friel Returns From Europe

Francis S. Friel, consulting engineer of Philadelphia, and immediate past president of the Federation of Sewage Works Associations, has just returned from a visit to a number of countries in Europe.

Mr. Friel's trip was for the purpose of attending an International Congress on Large Dams at Stockholm, Sweden. That meeting was attended by more than 400 engineers, representing 23 countries, including about 20 persons from America. As a part of the meeting there was a five day tour of Sweden in a special train to visit dams and power plants. Included in the itinerary was a location above the Arctic Circle where the mid-night sun could be observed.

Mr. Friel also attended the International Congress on Soil Mechanics at Rotterdam, Holland. This meeting was attended by approximately 600 engineers from many countries. Mr. Friel reports that the Europeans are pioneers in the soil mechanics field which has drawn the interest of a large group of young men.

In addition to attending these two meetings, Mr. and Mrs. Friel also visited Belgium, Luxemburg, France, Switzerland and Italy, England, and Ireland.

Who Wants It?

Some one of our readers has recently sent in a Reader Service Card marked for items with key numbers 412 and 428. Since the gentleman who sent in the card failed to enter his name and address we can't fill his request. Apparently he desired information on the electronic relay control produced by the R-S Products Corp. and their valve catalog.

If the gentleman from Brooklyn will be so kind as to send us his name and address we will be very happy to have information on these items furnished him.

Enslow Becomes a Councillor in U.S. Chamber of Commerce

Representing AWWA as President

Pursuant to his duty as president of the Am. Water Works Assn., Linn H. Enslow, editor of *Water & Sewage Works*, has been appointed a National Councillor of the U.S. Chamber of Commerce.

One of the underlined objectives of the National Chamber is that of encouraging business men and administrators in commerce and industry to think in national terms. In consideration of this worthy objective AWWA has for several years maintained membership in the U.S. Chamber of Commerce in an endeavor to advance the cause of national water resources and the status of the water supply industry in general.

EXPERIENCE WITH THE OXYGEN ARC METHOD OF CUTTING CAST IRON PIPE*

by
SHERMAN L. ROGERS
Supt. of Distribution
METROP. DISTRICT WATER BUREAU
HARTFORD, CONN.

Using the Oxygen Arc
Starting of the cut.

THERE are several ways of cutting cast iron water pipe, but practically all except one have the disadvantage of being either slow or uncertain when pipes larger than 16 inches in diameter are to be cut in a trench.

The Oldest Methods

Probably the oldest method of cutting cast iron pipe is to mark the pipe where the cut is to be made with a diamond point chisel and then attempt to crack the pipe by driving chisels and wedges into the resulting V-shaped cut. If the pipe is marked all the way around, this method is usually satisfactory, but it is quite difficult to chip the underside of a pipe of any size and the tendency is to take a chance on the pipe breaking square without completing the cut. To remove a section of a 42-inch pipe in this way may take eight or ten hours, since it will be necessary to make two cuts and to waste, as a general thing, at least three feet of the pipe. On 4-, 6- and 8-inch pit cast pipe this method works very well but the harder centrifugally cast pipe is likely to be the more difficult it is to cut with diamond point chisels.

*This paper, read before the New England Water Works Assn., is printed by permission of the Association.

Wheel pipe cutters similar to the wheel cutters used by plumbers to cut ordinary wrought iron pipe are available to cut cast iron pipe in the smaller sizes, but we have not found this method very successful where all the sections of pipe are firmly home.

The Strickler Cutter

The Strickler pipe cutter is a cutting device, one part of which is bolted around the pipe, and the other part, carrying one or two milling tools, revolves in a raceway in the first or stationary part. On the small sizes, a ratchet handle operated by one or two men turns the revolving section and a star fed cutting blade is automatically fed into the pipe, milling out a strip of metal about one-fourth inch wide. When two cuts are made the section between them can be lifted out without wasting any of the pipe. On 42-inch pipe this machine is quite heavy and even with a crane upwards of two hours are required to set it up.

Completing the Cut and Burning Out the Bell-Joint
Note the smooth straight cut.

We recently made two cuts with such a cutter in 42-inch cast iron pipe that had a wall thickness of nearly 2 inches. In this particular case the machine was driven by an air wrench and the cutting time was slightly over two hours per cut with an additional three hours required for the installation and removal of the cutter. Therefore, the total time required to cut out a section was approximately seven hours. The cost was as follows:

Rental of cutter, including freight	$124.71
Labor:	
7 hours, foreman	10.85
28 hours, labor	32.20
Rental of air compressor	7.00
Rental of crane, 4 hours	50.00
Total cost of removing section of pipe	$224.76

The Oxygen Arc Method

At about the same time that these two cuts were being made another method, known as the "Oxyarc" Cutting Method, came to our attention. It was so highly recommended that it was decided to try it out on two remaining cuts to be made in connection with this job.

According to the manufacturer's catalogue, the cutting speed in cast iron of this thickness should have been 2 inches of pipe circumference per minute or about an hour per cut. However, probably because of inexperience on the part of the operator, the overall time for the two cuts was about four hours. The cost was as follows:

Lifting Out Cut Section for Valve Insertion

New Valve in Place

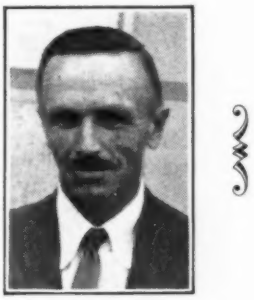
In connection with this particular job, completed since the writing of this paper, the author reports that the total elapsed time from main shut off to turning water back in was just 12 hours. The pipe was, however, only 30 in. diameter as compared to the 42 in. main cuts reported on in this article.—Editor

Rental of welding machine and welder	$ 84.00
Labor, 2 hours	2.30
Foreman, 1 hour	1.55
Crane, 1 hour to remove section of pipe	12.50
Total cost of removing section of pipe	$100.35

From this it can be seen that there is a very favorable price differential in favor of the oxygen arc method of cutting. And, what is often more important, credit must be given for a distinct saving in the time that the main has to be shut down for the cutting operation.

The "Oxyarc" method of cutting pipe consists primarily of the use of a special welding rod holder which is connected not only to a welding machine but also to a tank of oxygen. The rods used are of mild steel and hollow, with a special outside insulating coating. The electric arc is struck in much the same way as in welding and then the oxygen is fed through the hollow welding rod right into the arc. This raises the temperature at the tip to something like 10,000 degrees. At this extreme temperature the cast iron is rapidly melted or oxidized and blown out, partly as iron oxide and partly as molten metal. The high temperature is so localized at the welding tip that the pipe is barely warm two inches away.

This method requires less skill than ordinary welding because the rod is drawn across the work and no attempt is made to hold a constant arc length as in welding. The demand on the welding machine varies with the kind and thickness of the material to be cut; for 2-inch thick cast iron about 225 amperes at about 25 volts and oxygen at from 40 to 65 lbs. pressure is required. Either a direct current motor generating set or an alternating current transformer may be used as a source of power.



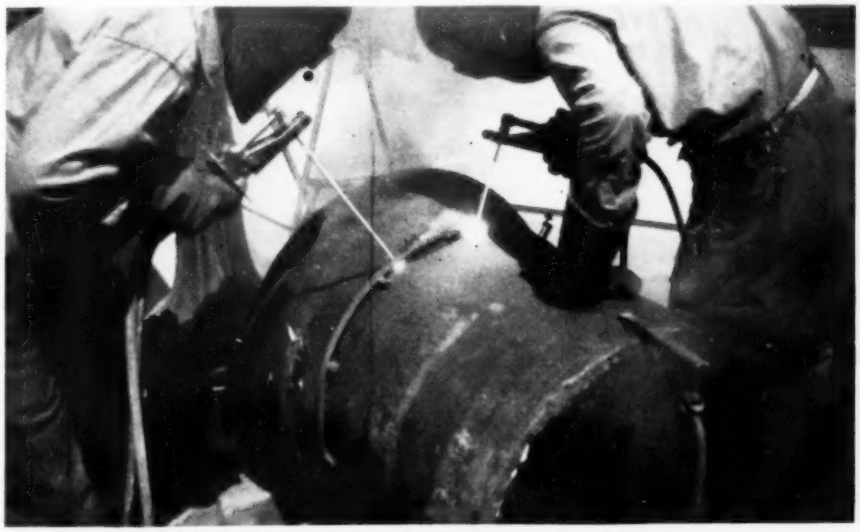
The Author

Although a pipe may be full of water it can be cut as well as a dry one, except that steam interferes with the operator's vision and must be blown away. If the water utility has its own welding machine the biggest item of expense is the cost of the rods. They are considerably more expensive than ordinary welding rods and apparently more are used for each inch of cut. It is estimated that it costs about 71 cents per circumferential foot of cut to cut cast iron that is 2 inches thick. This cost is divided about as follows:

Cutting rod	59%
Oxygen	18%
Labor	21%
Current	1 to 2%

Cast iron pipe has also been cut with the oxy-acetylene torch, but not with too satisfactory results, since the ends of the pipe are apt to be jagged and covered with beads of melted metal. It is also possible to cut pipe with a regular welding machine, using regulation welding rods, by reversing the leads to the work and taking off metal instead of putting it on as in welding. This is the most tedious method of all.

For real efficiency, the "Oxyarc" Method seems to be the best development to date. It is reported that several other water departments are also using the "Oxyarc" method of pipe cutting.



"Oxyarc" Cutting Procedure at Closer Range

Note the special welding rod holders and the hollow tubular weld-rods, supplied with oxygen to produce a 10,000 degree arc which melts and oxidizes the iron as it rips through the wall.

OUR RELATIONS ARE ALWAYS WITH US!

An Open Letter to Doc Symons About Public Relations

from

JOHN E. KLEINHENZ
Publicity and Advertising
INDIANAPOLIS WATER CO.
INDIANAPOLIS, IND.

DEAR "Doc": Your letter asking about "my relations—public, that is—" recalled to mind some I had almost forgotten. When you are living with them every day, you grow accustomed to them. Perhaps you get to take them for granted and forget to do the little things that, overlooked, become magnified in Uncle John Q.'s mind until he begins to nurse a grudge against you.

You might compare the public relations of a water works to the water produced by the plant. Both are somewhat intangible.

Of course, the water can be seen, felt, heard (remember "Bloop-Bleep," Doc?) and put to use. But still the customer can't see its goodness, its safety, its freedom from those many-syllabled bacterial organisms that fellows like myself just call "bugs" and leave to the chemists and the plant operator to eliminate.

All the customer knows—if he has been properly apprised of the fact—is that the water is safe to drink. And so he drinks it, usually without realization of the years of planning and the work necessary to purify, pump, and otherwise supply that water. He takes it for granted—and rightly so.

Public Relations Are Intangible

Public relations is an intangible, too, insofar as its physical make-up is concerned. You can't see it, but you know it's there—for better or for worse.

The Author

It might be reflected in the face of the disgruntled customer across the desk, complaining about a high bill and utterly disregarding the fact that he had been notified a month before about that leaking flush ball in the basement toilet.

Or you might get an encouraging whisper of it in the tones of an appreciative housewife who telephoned to say that our meter reader was so-o-o-o considerate in the way he wiped his shoes most carefully before he came into the house from the slush and snow outside. (By the way, Doc, what did they do about reading meters in New York City during that 25-inch snowfall?)

Yes, a water company's public relations are ever-present, like the much-maligned mother-in-law, but whether they are good or bad depends on how much thought, work, and attention you give to them. Very seldom—practically never—does goodwill toward a utility arrive full-grown—like John Henry. It must be planned, cultivated, and maintained.

Often the management of a water works might let its public relations slide a bit because of the press of other work and the difficulties of keeping the plant functioning properly. This was most likely during the past few years, when the shortage of materials and labor and practically everything was enough to drive a conscientious man to drink other than his product . . . such things like worrying about getting enough pipe to lay mains to serve houses in a new subdivision where the people were clamoring for water. Those folks—presently not customers but very anxious to be—are our public relations too.

They are especially hard to appease because they're in need, but they should realize that we're in business too and would like to supply them pronto but "no can do." They may not understand the problem we have in getting supplies, but Lord knows they should, as they very likely had the same difficulty in obtaining building materials. Something like casting that first stone, eh, Doc?

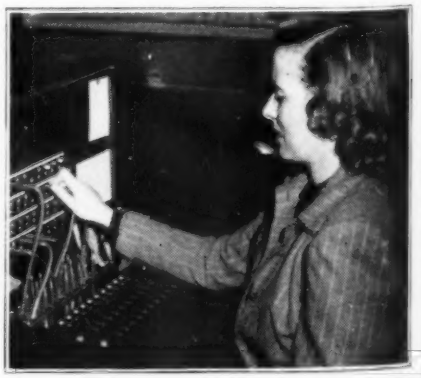
Making them understand is our problem. For each one whom you contact personally, there are a dozen more who never learn the answer.

Newspaper Advertising and News Stories

How to reach them? Well, newspaper ads are one method, but here you just have to hope that the ads are read. These ads should be attention-getters, informative, and true. If there is something to be explained, do so.

Somehow I don't go along with the theory that the intelligence of the average newspaper reader is that of a 12-year old child (although my six-year old son sometimes surprises

Getting the Customer Off to a Good Start Is Half the Battle



The "Voice" that Greets Hundreds of Callers Must Have that Smile—Plus Efficiency

A City Ordinance Requires a Stop Before Crossing Sidewalks; but Common Courtesy Should Prevail

(The name and insignia of our company are pretty apparent)

me with his growing accumulation of things intellectual, and twice his wisdom—on a chronological basis—he would make the Quiz Kids look like pikers. It stumps me. Pardon the personal meandering, Doc.) I think that the average reader is able to assimilate a lot of ideas.

Of course, in these ads you shouldn't get too technical. The water business is a skilled profession and has its own specific jargon. Everybody doesn't know, for example, that "mgd." means "million gallons daily" —an abbreviation that might conceivably be used in an ad telling of the record-breaking water pumpage last summer.

Nor might they be interested or curious enough to read through a detailed description of just how the company maintains its distribution system—why it is necessary to oil and test fire hydrants and clean out the drips before winter comes.

Here in Indianapolis, we have tried several styles of newspaper advertising. One was the above informational type written in what we fondly hoped was an interesting manner, chuck full of human interest. Another was the conventional display style — short, snappy caption, attractive illustration, and a few words of explanatory copy.

We keyed those ads at various times to try to learn whether or not they were being read, but frankly, we still don't know. Each style produced some requests for booklets on how to take care of the lawn or goldfish or —what did we have to offer?

Right now we're reverting to the display type—on the theory that with so much other reading matter in the newspapers, folks just won't wade through 250 words of advertising copy. Now, we'll give 'em a thought or two—and hope they stick!

Newspaper ads, though, are like using a shotgun when you need a rifle. The person who needs to know some certain information doesn't always get it. That's when other media of dispensing information are needed.

Stories in the news columns of the daily papers are more likely to be read than the ads. However, you can't always be sure of getting a story in when you want it in; editors do have the privilege of using the material they want. If they can be convinced that certain publicity has real news value, they'll fall on your neck; but they have to watch their paper supply carefully nowadays, as you well know, Doc. (Am I rambling too much?)

Follow the A.W.W.A. P.R. Program

That series of studies on public relations put out by the A. W. W. A. last year was thorough and provocative of ideas, with down-to-earth production methods that could well be followed by all water plants, private or municipal.

We think that point-of-contact information is helpful, so we use displays and posters in the lobby of our office, which is visited by hundreds of customers every day. These exhibits can be sales-minded as well as informative—if you're interested in selling water (?) as well as service.

At present we have on display a map of the distribution system, a topographical plaque of the watershed, and a sample of a box which we recommend for unheated basements to keep the meter from freezing. Then there is the ever-present goldfish aquarium—just a subtle reminder to the doubting Thomases that our water is fit for a fish to live in. Certain national campaigns, such as Fire Prevention and Clean-Up, Paint-Up Weeks, are tied in with our product to mutual advantage.

A book of all-around information is an essential. This should include the history and background of the company, how it functions, and its plans for the future. A good understanding of the company ofttimes will provide the first words in that "soft answer that turneth away wrath."

Personal Contact Important

But all the newspaper ads and displays and booklets could not completely repair the injury that some thoughtless personal contact by an employee might provoke.

The Meter Reader Is Our Real Ambassador of Good Will

(Here one calls attention of the housewife to a matter that will save her money in the future.—P.S. She wrote a nice letter of appreciation of his advice, too.)

Each employee *is* the company to the customer he meets as he goes about his daily duties; he is also "the company" to his circle of friends and others who learn that he works for the water company. It is vital that he, too, should know about the company—know more than the customers. Here is where an employee handbook and a regular employee publication can be of immeasurable help.

Doc, I don't know whether or not you put much stock in that ancient adage, "love at first sight," but it certainly is a good slogan for obtaining better public relations. The first impression a customer receives is often the lasting one.

The contract clerks must do a good job, not only in the paper work but on the human side. The customer must be made to feel that we are glad to have him as a customer, rather than receive a grudging admittance that "yeah, we'll turn your water on if you're home at such-and-such a time."

Customers are observant, not only of an employee's dress and manner when he is waiting on him, but of his actions before and after. Was a newspaper or magazine or even the latest Perry Mason "detecative" story (how I love 'em!) pushed to one side to make room for signing the contract card? If so—and if by some chance the water wasn't turned on within a reasonable time after we had promised it would be, might not that customer get the feeling that—well, the meterman stopped along the route to read the paper, too. A natural—and undesirable—reaction.

Along the same line, there is the ever-prevalent habit of employees "visiting" another's desk—or talking back and forth. Although this is usually in portions of the office, or plant, where bona fide customers seldom appear, there are those "indirect" customers—still "public relations": salesmen, adding machine maintenance men, plumbers, and the like. They too might get the wrong impression of our services. Such matters may seem trivial if they do not interfere with the actual performance of work, but—well, there's food for thought.

Unseen Contact

Many times a day customers make unseen contact with us—via the telephone. If the telephone operator—that "voice with a smile"—is the right type, then the caller is ready to beam upon the clerk who next handles his query. The operator has paved the path with pleasantness.

At the bill-paying window, a smile and a genuine "thank you" are absolutely essential. They will do a lot to soothe the ruffled feelings of a man who is digging into his pocket to meet a bill just a little higher than usual. (Anyway, why not thank the person who helps pay your salary, huh?)

All of this should be natural enough. The Golden Rule should apply here as it should to all forms of relationship between men. Human beings being what they (we?) are, however, sometimes that brotherly spirit must be imparted rather than self-imbued.

Friendliness begets friendliness. One satisfied customer can do more to better public relations than a dozen ads. She tells her circle of friends, they tell theirs, and so on—like the waves that radiate from a stone dropped in a still pond. But when she writes in to tell us about some thoughtful action performed by one of our employees, that puts us in a rosy glow for the rest of the day and enables us to face the gripers with equanimity.

A Water Works Man Is Always on the Job—

(At work, lodge, or over a friendly game of stud in his home)

Here is a letter which did that to us:

"We wish to thank you very much for the manner in which our complaint of a sunken place left by your company in repairing a leak was taken care of. The young man who does repair work was very courteous and considerate and also the men who came out and filled up the sunken place. They did the job well and also were considerate and treated us with courtesy."

And here's another:

"I can't resist writing you a note of thanks to commend the water company for having such efficient help. I had a nasty leak in front of my home, called the water company, the telephone operator was very nice in giving me information, and that afternoon a serviceman called at my home. He was one of the most courteous men I have ever had the pleasure of doing business with."

And yet another—

"Investigation showed the trouble was on my property but not before the sidewalk was taken up. I called my plumber, had the pipe renewed, and your patching crew called and replaced the walk. The ease and speed amazed me; in fact, the whole incident has me baffled. I thought this sort of service had been discontinued. Thank goodness it hasn't. Again, thank you."

These happened last year. The attitude probably would have been even more pronounced if they had occurred during the war years when customers were accustomed to being snapped off with a grunt—in most cases.

One phrase in that second letter tells some of the story—"efficient help." It is fundamental, of course, that all employees be able to do their work efficiently—and have the interest to do it. If they also have the friendly touch, so much the better.

Letters as these, we repeat, make us feel fine. As you know, Doc, in the water works business we are more accustomed to receiving brickbats than bouquets. People are so prone to take our services for granted—as they're entitled to—that they seldom make any comment unless something goes wrong.

We used those letters in our employee magazine, *Water Lines*. They were news, of course, but more so, they were good morale boosters. They showed the employees that customers did note the manner in which we did business. They served, we hope, as a bit of subtle propaganda to give other employees an idea of the way that we'd like for them to conduct themselves. A better method than sermonizing, I think.

At present, our company has about 330 employees, about 50 of whom meet the customer directly. The remainder, though, should be informed of the facts of life about the water works, because there may arise certain situations in daily life when a bit of knowledge might enable the employee to set a customer right about some procedure entirely out of the employee's line of work. One article of this nature which was printed in our employee paper, is presented here in its entirety:

"Keys to the City"

"If you ever have considered a heavy bunch of keys in your pocket to be a nuisance, then read on and sympathize with those of our personnel who must carry 'em by the dozen. These keys are not their personal ones, of course, but those given us by customers to facilitate our work.

"Some folks are never at home in the daytime, hence must provide some means of access to read the meter. They do this either by giving us a key with signed permission to use it for that purpose, or by granting approval to use a passkey.

"Our meter readers carry the weight of the burden because in a month's time their duties cause them to enter a majority of the homes in the city. Then come the customer servicemen who are needed to set, remove, inspect, or repair meters.

"At present we have over 3200 keys. Passkey permissions number in the thousands. The keys are brass-tagged with the account numbers of the properties and assembled on a ring, one for each route. The greatest number of keys on one route is 24—nearly a pound of metal to make the pocket sag!

"Most of the keys are for homes, of course, but next most numerous are churches where "open house" is not an everyday affair. Then lodges and warehouses. The name or address of a property does not appear on the tag—thus if the keys are lost, the finder would see just our name on the tag and return them. Meter readers seldom think of customers by name——merely by number.

"The keys are seldom lost—fortunately. Sometimes a reader leaves them in a lock and has to retrace his steps until he finds them. After such an experience, he usually asks for a leather thong to fasten them to his belt.

"Occasionally a reader breaks a key in a lock—this might happen six or eight times a year. Then ingenuity and logic combine to remedy the mishap.

"Possession of such keys is 'dynamite' though, because of the responsibility attached. Customers are under no compulsion to give us keys, but they do so for our mutual benefit. Although the permission granted is pretty all-inclusive as to claims and damages, if something would happen we'd feel mighty bad about it. Our customers put a lot of trust in our company and its employees and this trust has seldom been betrayed.

"Friendly feelings have developed through keys. Maybe the system might be called 'the key to better customer relations'. Witness these letters:

"'Enclosed is the key . . . . Since I work it is impossible for me to be at home, and I realize that I should have done this before, both from the standpoint of your men and mine. If you will send me the full amount of my bill—God help me—I'll pay it. Could you send along a shock absorber as it will surely be a duzey? To borrow from the Book of Common Prayer,'mea culpa, mea maxima culpa'. Thanks for your patience.' (Translation of the Latin is 'through my fault, through my most grievous fault.')

"Then there's the unusual side. To wit: 'I work every day and cannot allow anyone the use of my key because I have two dogs penned in the house during my absence. One of the dogs has leakage of the heart and cannot be excited, and a stranger entering or making any noise about the house might cause a fatal heart attack.'

"Hmmmm! Usually the reader is on the danger side."

Doesn't that convey something of what I hinted a few paragraphs above? Also, I feel that the letters show that customers are just people, the same as the meter reader, the boilerroom fireman, the filter operator, and like to be treated as such. I've found that out in meeting them in large masses.

Talk to the Public

There is a difference between meeting the public on the job and being invited out to talk to a club or group of people. The meter reader or serviceman must react instinctively to a situation that requires tact, politeness, and consideration of a customer's feelings. He really has the toughest row to hoe—that spur-of-the-moment reaction must be right.

The company representative who is the featured attraction on a program has been primed by the invitation. He knows what he is going to say and he can anticipate from current conditions just about what questions he will receive from any audience.

Our company has done a lot of talking in telling its story to the people of Indianapolis. The manager and others of the staff have made speeches before various groups, but the foremost means of putting ourselves across to the masses has been the motion picture.

Home Made Movies

We have made several movies—six, not counting the latest which will go on the circuit this Spring. Three have been of general public relations themes, suitable for showing before groups of all ages and characteristics. They told the story of the water supply, interspersing technicalities with human interest—sort of sugar-coating the pill, you might say.

The first movie was made in 1933—a black-and-white production titled "Behind the Water Front." In 1935 came "Water Colors" and in 1940, "The Waterway to Health." The latter two were photographed in Kodachrome; color certainly adds a lot to the pictures.

The other three were likewise in color, but were of a different type. One showed the erection of our Blue Ridge elevated tank, "Over the Peak in Blue Ridge," completed in 1939. Another showed the construction of Geist Reservoir in various stages of its development and was so titled. It was finished in 1943.

The earlier films were made by a commercial photographer but the ones since 1940 were photographed by me. Such items as titles and drawings were made by laboratories doing that type of work. With a good camera and careful planning and workmanship, an attractive movie can be made by "local" talent.

Shortage of color film stymied production of another general purpose movie until last summer, but in 1945 a short subject, "Let's Go Out to the Reservoir," was assembled from past shooting sprees at that most photogenic locale.

The construction films had a limited appeal and were shown chiefly before technical groups and civic organizations in the territory affected by the new developments. The short reservoir movie has been of value in acquainting folks with the purpose—as well as the beauty—of the reservoir.

The new motion picture borrows its title from those A.W.W.A. public relations issues: "At Your Service—

Customers' Keys Are Carefully Catalogued and Kept Safe

Willing Water." In it we show the Fall Creek division of our system: the reservoir, the purification plant, the pumping station, the elevated tanks, and wind up with some of the many uses to which the water is placed. The other films had concentrated on the White River division, inasmuch as Fall Creek was not an integral unit until 1943.

This movie is our first venture into sound—but still in a modified version. Background music will be placed on the film but the narration will continue to be delivered in person by the narrator—yours truly—over a microphone.

This method of delivery has its advantages. The narrator is able to vary his talk to conform with different audiences; he can ad lib, which when properly done adds much to the effectiveness of the picture; pertinent points of timely interest can be stressed. With a recorded talk, such

Just Scrap Metal Now—

(Hundreds of keys no longer of service, unclaimed by residents)

points naturally cannot be emphasized.

Since 1933, our six movies have been shown to an estimated audience of 110,260 persons in 1036 showings. These have been fairly evenly divided between adult groups—civic associations, luncheon clubs, PTA, and the like—and schools, from the lowest grades to colleges.

The results from these showings have been extremely profitable to the company through the better understanding engendered especially so, I feel, through the school showings. Many of those students—those before 1940, anyway—are now adults. They have homes and families of their own, and more likely than not, are our customers. Their knowledge of our company naturally has been enhanced through the viewing of these movies, and their familiarity with our operations has made them more understanding. Something like the old "get 'em young" saying, but we don't "treat 'em rough and tell 'em nothing."

Well, Doc, I hope this rambling letter has given you some idea of our methods of getting along with the public and our customers. I know I've hurried over several points and left out others entirely, but there is so much to tell about each. After I read this over, I'm sure I'll admonish myself to "practice what you preach."

Cordially,

J.E.K.

Menzies Heads Canadian Health Department

J. R. Menzies has been promoted to the position of Head of the Public Health Engineering Division of the Department of National Health and Welfare of Canada. Mr. Menzies was formerly supervising engineer for the Atlantic region, and has been acting chief of the division since the retirement of G. H. Ferguson last October.

In his new capacity Mr. Menzies becomes a member of the Technical Advisory Board to the International Joint Commission on Boundary Water Pollution. Mr. Menzies also becomes chairman of that board.

Los Angeles' Hyperion Project Progressing

The Hyperion Sewage Treatment Works of Los Angeles is now well under way. This project which will cost $41,000,000 is designed to end beach contamination in the vicinity of Los Angeles. The readers of *Water & Sewage Works* will recall the article by Reuben F. Brown in 1947, dealing with the pollution of beaches in the vicinity of Los Angeles and methods used to reduce contamination.

The new plan will consist of primary treatment units followed by high rate activated sludge. Capacity will be provided for treatment of 245 mgd. designed to handle the sewage from the population of 3,000,000 people. The treated sewage will be discharged by submerged outfall one mile off shore in the Pacific Ocean. Chlorination will be employed.

W. H. Ogden Vice Pres. Scranton-Spring Brook Water Co.

William H. Ogden, former manager of the Long Island properties of New York Water Service Corp., and South Bay Consolidated Water Co., has been elected vice president of the Scranton-Spring Brook Water Service Co.

Mr. Ogden will be operating executive of Scranton-Spring Brook, which serves a large area in northeastern Pennsylvania, including Wilkes-Barre and Scranton. The company furnishes water service to more than 130,000 customers and gas service to more than 30,000.

Mr. Ogden is succeeded in the New York Water Service Corp., by N. Frederick Fenn, Vice Pres. and Ch. Engr. of South Bay.

Westchester Water Works Conference Outing

The 8th annual meeting and outing of the Westchester Water Works Conference was held July 28 in the town of Greenburgh. Beginning at 1:30 p.m., with outdoor games and other sports, the meeting included as a special attraction a main-tapping contest.

A cup for the contest winner was donated by Al Kassay, Supt. of the Tarrytown Water Dept. Each team consisted of two men who had to supply their own equipment for a ¾ inch tap. The tapping contest was won by the team from Peekskill, N. Y.

The activities concluded with a dinner and an annual meeting in the evening.

South Carolina W. & S. W. Association Meeting

The annual Business Meeting of the South Carolina Water and Sewage Works Association was held at Heise's Pond, Pontiac, South Carolina on August 12. No technical sessions were held during this meeting. Activities other than the business meeting included a barbecue with all the necessary trimmings.

The business meeting was called to order by President E. D. Fry, and at the conclusion of the session W. C. Hunt was in charge of the serving of the barbecue.

THE STORY OF WATER

A Non-Technical Talk to Publicize the Unadvertised Labors of the Water Works Profession

by
FRED E. SMITH
Chemist
WATER PURIFICATION PLANT
CAMBRIDGE, MASS.

The Author

This is another in our series of presentations showing how talks on water and sewage can be presented to non-technical audiences.—The Editors.

THE struggle to obtain food, provide shelter, and procure sufficient water has existed since mankind has inhabited the earth; and the standards of these necessities of life have been constantly raised throughout the centuries.

Methods of food production had their beginning in the individual efforts of prehistoric man to kill game and to use whatever vegetation was available in his section of the earth. Utilization of nature's resources has enabled housing conditions to rise from those of the cave-dweller.

In similar trend, standards of domestic water quality have been raised. A significant difference is noted, however, in the distribution of this necessity of life. In a large city standards of living vary considerably according to the financial resources of individuals. But standard quality of drinking water is supplied to all inhabitants of a city irrespective of personal economic status.

Early Water Supply

Early man made use of streams, springs, and lakes as sources of drinking water. The unknown individual who dug a hole in the ground and found to his surprise that water entered the excavation should be credited with the development of the first artificial source of water supply, namely wells. Ancient history records several famous wells such as Joseph's well in Cairo. Centuries ago in China there were in use wells several hundred feet deep. The extensive water works of the Romans conveyed water long distances to their cities. One aqueduct erected in Spain in the year 109 A.D. was still in use in recent years.

In the United States the first settlers obtained drinking water from flowing streams or ponds. There is a report that the Pilgrims in 1620 rejected the site of Provincetown as a settlement because of the difficulty of securing water. Plymouth instead was selected.

The first attempt to provide a municipal water supply was made in Boston in 1652. Springs served as the source of supply. The number of public water supplies had increased to 17 in the year 1800. Today there are more than 12,000 public water supplies in this country, some of which serve more than one community.

It is a question whether many inhabitants of a community are aware of the extent of the water works organization which delivers drinking water to the home. In like manner people have no knowledge of the numerous safe-guards employed to maintain the quality of drinking water demanded by present-day standards.

Public Lacks Knowledge of Water

There are reasons for the lack of knowledge on the part of the public concerning the community water supply and its complementing divisions. Water sheds, storage reservoirs, and areas from which well water is obtained are often located at a distance from the city in which the water is consumed. Pipe lines which distribute water to the homes of consumers are buried underground. In the home pipes which deliver water to the several outlets are concealed within the walls. The fixture from which water flows at the turn of the valve alone indicates the presence of ample water on the premises.

As a result of the public's matter-of-fact acceptance of water supply, interruption of water service is a matter of concern in the homes of consumers. Household routine is considerably deranged by a brief period without water service. A little thought upon the consequences which would result from a serious failure of a community water supply reveals the extent of such a catastrophe.

Sewerage facilities depend upon the availability of water to remove city wastes. Disease would become rampant if it were impossible to remove these wastes. Central heating units would be unable to operate without water for steam production. If a conflagration occurred the entire community might be destroyed without water to fight the flames. The impossibility of life existing in a modern city without adequate water is readily apparent. During the disastrous floods of 1936 which crippled the water supplies of many communities, restoration of safe water even on a restricted basis was one of the first efforts of the authorities.

Water Borne Disease

The necessity of maintaining standards of drinking water quality became evident when scientific studies showed that intestinal disease, such as typhoid fever, could be transmitted by impure water. Application of the new principles of sanitary water analysis indicated that many waters of original purity had been rendered of questionable quality. This condition had been caused by residential or industrial developments from which wastes were permitted to enter the water supply. An illustration is seen in a situation where cities use the same river for water supply and sewage disposal. Abandonment of an unsatisfactory source of water supply and securing a new supply became increasingly difficult as development of this country progressed with industrial and community expansion.

The solution of the water supply problem was achieved in many instances by purification of the existing supply. The result of water purification in the United States has been the sharp reduction in the typhoid fever toll of cases and deaths. Older people living today can recall the time when

typhoid epidemics were of frequent occurrence in many communities. Today, with the principle of safe water supplies firmly established, the rate of water-borne typhoid fever cases per unit of population has nearly reached the vanishing point.

Safeguards

The operation of a public water supply in such manner that disease will not afflict a community through the medium of its drinking water is a serious responsibility. Safeguards to protect water quality are in operation throughout the extent of the water supply system.

Sanitary protective measures are instituted on the water shed over which regular inspections are conducted. Unfavorable conditions in this area are corrected or removed. Storage of water in reservoirs requires the enforcement of sanitary regulations in adjacent areas. Reforestation programs have often made reservoir sites into places of natural beauty with consequent appeal to the picnicker and automobile party.

The purification of a water supply by means of filtration requires scientific control of the treatment as an absolute necessity if successful results of operation are to be obtained. The system of pipes through which water is distributed to consumers is carefully guarded against breaks and failure of water service. The repair of old pipes or construction of new mains requires sterilization of the new sections before the line is placed in service. Constant vigilance in the application of safety measures is necessary for the production of drinking water which is pure at all times.

Improved Water Quality

In recent years standards of water quality have been broadened to include conditions other than safety, always the first requisite. Formerly, if a supply were safe, or was rendered wholesome by adequate treatment, little consideration was given to other qualities of the water. This is no longer true. Examples of conditions encountered in water treatment which in the past were ignored are color, turbidity, hardness, corrosive powers, unpleasant odor and taste, and excessive iron content.

High color detracts considerably from the appearance of water used for domestic purposes. The coloring matter is extracted from grass, leaves, and vegetation. It is perfectly harmless. Filtration of the water supply, however, will remove or reduce the color. The appearance of drinking water is most attractive in communities provided with filtration plants.

Turbidity may be responsible for the unfavorable appearance of a water supply. This condition is caused by the presence in the water of finely divided particles of earth or clay in suspension. The effect in a glass of water is a cloudy appearance when the water is viewed toward the light. After a heavy rain the "roily" appearance of a brook or stream is caused by the high turbidity which resulted from material added to the water by the surface runoff. Filtration of water removes turbidity and delivers a brilliant water to consumers.

Rising standards of water quality require that the hardness or soap-consuming power of a water be reduced. A hard water not only increases household soap consumption, but also minimizes the efficiency of heat production. The life of fabrics is lessened by repeated washings with hard water. Modern methods of treatment can materially reduce the excessive hardness of a water supply, and many cities have erected water-softening plants for this purpose.

The corrosive power of a water supply is of importance to consumers. The life of household plumbing is materially shortened if the water supply is capable of attacking the metals in the pipe. The corrective treatment applied to many waters in order to reduce corrosion of pipes directly benefits all water users.

Taste and Odor Problems

The problem of unpleasant odor and taste in drinking water has received considerable attention in recent years. Odor and taste are sometimes the result of decaying organic matter in water. Microscopic growths which occur in many supply reservoirs are able to impart odor and taste to the water. Careful exercise of control measures is conducted to remedy conditions which might render drinking water unpalatable. A serious result of unpleasant odor and taste in a safe drinking water is the utilization by consumers of other sources of supply, the safety of which is often questionable.

Some waters extract from the earth's crust certain objectionable elements, for example, iron. If a domestic water contains an excessive amount of iron, pipe deposits are formed. When these are flushed from the pipe, staining of clothes and utensils will result. Many water supplies are treated in iron-removal plants to supply consumers with water of unobjectionable iron content.

In order to maintain present standards of quality, water treatment has been extended to a scope scarcely recognizable when compared with that used to meet standards of past years. It is a question, however, whether the public is aware of this fact.

Water for Industries

Industrial water treatment has become of increased importance. The time has passed when water of inferior quality can be considered satisfactory for many industrial purposes and it is not generally known that the community water supply has considerable influence in the selection of a city for the location of an industrial establishment which requires large quantities of process water. A city or town provided with purification facilities has an added advantage to extend to industry, which few industries overlook.

Water Consumption Grows

Provision for the quantity of water required for a community is of equal importance with maintenance of standards of water quality. Plans to fulfill the water needs of a growing city extending over a period of years are not uncommon. These provide for the orderly enlargement of existing supply facilities or the procurement of new supplies in a manner that the financial burden will not bear too heavily on the taxpayers in a single year. Although industrial curtailment reduced water consumption during the depression, many cities today are faced with increased demands for water. The modern city with its homes encourages the use of water.

Bathroom appointments invite the use of water, and the general health of the people is benefitted by the greater cleanliness made possible by ample water supply. Carefully tended lawns and gardens require sprinkling, and consumption of water for this purpose is a matter of concern in some communities provided with little excess water over normal demands in summer months. New building projects, in particular huge apartment blocks, increase the volume of water consumed per unit of ground area.

Finally, it is noted that accompanying rising standards of water quality and quantity, there has been in many communities a progressive reduction in the water rates. Cambridge, Massachusetts, charges ten cents per hundred cubic feet of filtered water. A cubic yard, or twenty-seven cubic feet, of loam for the garden or lawn costs approximately three dollars. The expression, "Cheaper than Dirt," in fact applies to water, prime necessity of life, often too little appreciated by all of us.

RESULTS OF UNIVERSAL METERING AT NAUGATUCK, CONN.*

by
WILLIAM H. MOODY
President and General Manager
NAUGATUCK WATER CO.
NAUGATUCK, CONN.

THE FACTS and reasoning of the officials of the Naugatuck Water Co. in their decision to install universal metering were published in the May, 1945, issue of *Water Works and Sewerage* (now *Water & Sewage Works)*. A brief résumé of that article will serve to introduce the subject of this article, namely the results which followed the adoption of universal metering.

Naugatuck, situated in the southwest section of Connecticut, is an industrial town with about 17,000 inhabitants. The Naugatuck Water Co.—a privately owned company—has continuously furnished water to the city and a section of Waterbury and Beacon Falls, adjoining towns, for the past fifty-nine years. There is a high and low pressure distribution system, each supplied from its own storage reservoir by gravity. The water is soft and the only treatment is chlorination. The total storage amounts to 700 mil. gal. and the distribution system consists of 59 miles of main.

Consumption in 1942 had reached the theoretical production of the storage facilities. The solutions were: (1) increase the water storage and construct a new supply main at a cost of $300,000.00 and at a yearly expense of $30,000.00; or, (2) meter 3000 domestic and commercial services which were on a flat or fixture rate at a cost of $30,000.00 with a yearly expense of $6,000.00. Industrial consumption was already being metered. As past experience has shown that such a change has always been accompanied by a reduction in the amount of water required to supply the demand of the system, it was decided to install meters. This was done in 1942. The meters selected were 5/8 x 3/4-in. Trident frostproof bottom meters with a straight reading dial registering in gallons.

The object of metering was to save wasted water and the only increase in income asked for by the Company was $2.00 per year per meter, which was the estimated extra cost for metering. After a year's trial, a final rate was established with the income the same as received from the fixture or flat rate before metering, plus the increase due to new consumers, plus $2.00 per meter.

The Author

The town was divided into three equally sized districts, and each district divided into nine routes of 100 customers. Each customer was given a route and individual number which is shown on the visible index. Accounts are posted on a Kardex System. (End of résumé of previous article.)

METER RATE SCHEDULE

Meter Size	Quarterly Minimum Charge	When Quarterly Use of Water is less than
5/8 in.	$ 2.70	6,900 Gal.
3/4	6.00	17,900 "
1	9.00	28,700 "
1 1/4	15.00	54,600 "
1 1/2	20.00	79,600 "
2	30.00	139,200 "
3	50.00	339,200 "
4	75.00	589,200 "
6	125.00	1,089,200 "
8	225.00	2,089,200 "
10	350.00	3,339,200 "

First 6900 Gal. or less per Quarter	—	$2.70
Next 17,100 Gal. per 100 Gal.	—	.03
Next 21,000 Gal. per 100 Gal.	—	.025
Next 75,000 Gal. per 100 Gal.	—	.02
Next 32,880,000 Gal. per 100 Gal.	—	.01
All Over 33,000,000 per 100 Gal.	—	.006

Rates—Fire Protection

Sprinklers are charged for as follows:
$ .10 per head per year for the first 500 heads;
.07½ per head per year for the second 500 heads;
.05 per head per year for all over 1000 heads.
Private Fire Hydrants at a yearly rental of $25.00 each.
The present agreement covering the yearly rental for each Public Hydrant is $40.00 per year.

Selling the Idea

The change to payment for water by meter schedule from the flat or fixture rate appeared difficult when it was started and proved to be more so later. Local politicians and officials of a Union opposed the installations of meters and it was the task of the officers of the water company to prove their case which was done through the medium of public hearings, pamphlets, and the press. The opposition was not always fair and untruths had to be counteracted. Eventually, this proved a benefit as it was necessary to put forth more effort than would have been made without opposition and a thorough selling job had to be done.

When meter bills were high, it was necessary to visit the premises, inspect the plumbing and, in many

Office Building of Naugatuck Water Co.

*Presented before the New England Water Works Assn. and here published by permission of that association.

cases, make a record of the consumption for 24 hours by means of a Brainard Meter Master. Over one-fifth of the homes in Naugatuck were visited and this gave an opportunity to personally state the facts of the need for metering to the people who had the most reasons for opposing the change. The consumers, even those who did not take kindly to the change from payment of water by the fixture rate to the basis of measurement, now appear to be satisfied that universal metering is the fair method to pay for water just as it is for electricity, bread or any other commodity.

Metering Improves Public Relations

Up to the time that meters were installed, the officials of the water company had made no special effort to acquaint the public with the facts concerning the operations of the company and had taken the attitude of "letting sleeping dogs lie." The discussion of metering, however, brought out the fact that some customers had many erroneous ideas concerning the business of the company and this opportunity was used to correct these false impressions. Without question, these frank discussions have done a great deal to improve public relations.

The meter rate has proved to be equitable and the only revision made since it was established was an increase in 1947 to industrial consumers using over 33,000,000 gallons per quarter, from 6/10 of a cent to 8/10 of a cent per 100 gallons. This substitution was made because of the basic cost of water—the summation of all operating costs, depreciation and taxes had increased in four years from .006 to .008 per 100 gallons.

A minimum of $3.00 per quarter in the meter rate schedule was contemplated before the meter rates were established, but the Public Utilities Commission insisted on a minimum rate of $2.70 per quarter. On the other hand $1.00 per month for the benefit of water service is certainly not exorbitant. About 10 per cent of the domestic consumers pay the minimum amount. The cost per family for water for the year 1947 was $14.21 and the domestic consumption per person was 33 gallons per day.

Where Does The Water Go?

A properly conducted water supply company should know all the facts about its business. One of the most important is the *Quantity* of water consumed and *Where* it is used. The only answer to this problem is universal metering. By tabulating the consumption and income in each category, the number of gallons sold and the rate of income per unit can be figured. The difference between the total consumed and the consumption billed is the unaccounted-for water. With a gravity system, it is important to keep this to a minimum and with a pumped or filtered system, it is even more necessary on account of the additional cost of processing.

Before metering the supply at Naugatuck, it was thought that there was considerable water wasted but the quantity was unknown. After one year, with the supply metered, it was found that the unaccounted-for water amounted to 25 per cent. There were no underground piping leaks showing and it was not known where the loss was taking place. A pitometer survey was made which found some underground leaks and 245,000 gallons of water per day being used without being metered.

When meters were installed in factories, no fire lines were metered as they were supposed to be used for fire protection only. During the years, they were tapped for industrial use. The Pitometer Co. survey showed that this condition existed in two of the largest factories in the town and all the *fire* and *production lines* at these plants have since been metered at the connection with the supply main with 4 to 10-in. Trident Protectus or Compound Meters. As there is a fixed service charge for each sprinkler and hydrant used for private fire protection, an estimate made by the owner of the amount of water used for fire fighting and testing is deducted by the water company from the total amount of water billed. Both of these large sized plants are dangerous fire hazards and up to 500,000 gallons per month have been used for fire prevention. In 1947, the unaccounted-for water amounted to 14 per cent with no allowance for legitimate uses such as fire fighting, flushing et cetera which is estimated at 6 per cent. This is not ideal but the reduction in unaccounted-for water due to the installation of meters and the pitometer survey

Little Drops of Water

• • • Make the Mighty Ocean

LET'S STOP LEAKS!

At 60 pounds pressure water leaks through an opening

1/4 in.	1,200,000 gallons	$136.08 in 3 months
3/16 in.	675,000 gallons	83.58 in 3 months
1/8 in.	300,000 gallons	46.08 in 3 months
1/16 in.	75,000 gallons	19.08 in 3 months
1/32 in.	19,000 gallons	6.33 in 3 months

THE NAUGATUCK WATER COMPANY

WHY STOP LEAKS?

Reason one, to avoid high water bills. A leak in your house means that you are paying for water that nobody uses.

Reason two, if additional reservoirs have to be built to supply "water to waste" the cost of the new reservoirs would eventually have to be paid by the consumers.

Reason three, to protect our town against a water shortage during a series of dry years.

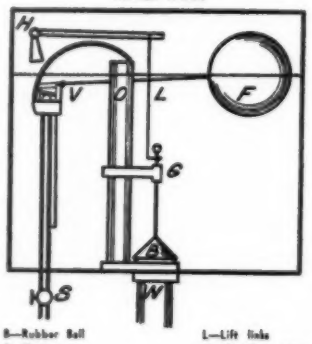
HOW TO STOP LEAKS

A leaky faucet or dripping pipe coupling is readily seen and comparatively easy to repair.

The fixture that wastes water is the TOILET and it is responsible for 99% of all the water wasted in our homes. Is your toilet tank stealing water? It can do it SILENTLY and since the water goes directly into the sewer it can do it INVISIBLY.

Test your toilet tank if your water bill is higher than usual.

TOILET TANK



B—Rubber Ball
F—Float
G—Guide
H—Handle
L—Lift links
O—Overflow pipe
S—Shutoff supply
V—Float Valve
W—Waste pipe

THE BLUING TEST

Pour a little ordinary washing bluing (or ink if you prefer) into the toilet tank as it is filling. Wait about ten minutes. Then, see if the color shows in the toilet bowl. If it does there is a leak in the working parts of the toilet tank that are under water.

THE FLASHLIGHT TEST

When the toilet has not been flushed for some time—check the water level. It should be about two inches below the top of the Overflow Pipe (O). Shine the flashlight down into the Overflow Pipe to see if there are any water ripples in it. Quite often, even in new toilets, the small "after-fill tube" which goes from Valve (V) to the Overflow Pipe (O) is found syphoning five or six gallons each and every hour of the day and night. This continuous flow frequently wastes more water than the entire family uses.

INTERMITTENT LEAKS

Make sure the Handle (H) and its lever work smoothly, not catching on anything. See that the Lift Links (L) are smooth and straight. Don't let the lower link hang solidly on the upper one, as it may prevent the ball (B) from seating tightly. If the lower link is rough or bent it may catch in the guide (G). The shoulder of the Rubber Ball (B) should be about one quarter of an inch above the metal ring it falls on. A Rubber Ball that is too large is often the cause of both intermittent and continuous leaks.

WHO SHOULD REPAIR WATER FIXTURES

When anything goes wrong with water fixtures make use of the services of a competent, licensed plumber. (Consult the classified list of plumbers in the telephone book.) Inexperienced people using hairpins, string, and adhesive tape to repair plumbing often cause a larger expense as a result of their efforts to save.

AFTER YOU HAVE TRIED THESE TESTS AND CANNOT LOCATE THE LEAK WE WILL GLADLY CO-OPERATE WITH YOU IN TRYING TO LOCATE AND STOP THE WASTE OF WATER.

THE NAUGATUCK WATER COMPANY

Pamphlet Used by Naugatuck Water Co. to Call Consumers' Attention to Leaks

has made available an additional 1,000,000 gallons per day which, if sold at the lowest rate in the meter schedule, would be worth $29,200.00 per year.

If the consumption of water had increased in a normal manner, the production facilities at Naugatuck would have been ample to supply the demand for several years. The industrial demand, however, increased to an unprecedented degree and it is necessary to add to the production source at this time. There is no doubt that the installation of meters was the logical first step as it has made available 1,000,000 gallons a day with an investment of $35,000.00. To add the same amount to the production by means of increased storage would cost many times that amount. Installation of universal metering by the Naugatuck Water Co. has resulted in a moderate increase in the cost of water, instead of a large increase, to the consumers. The water company has benefited due to increased knowledge of the actual use of all the water that is distributed and has been able to salvage wasted and unmetered water in the amount of 1,000,000 gallons per day which prevented a water shortage. The company is also in a position to further increase the efficiency of the distribution plant and continue to furnish an ample, safe and palatable supply of water to the consumer at the least possible cost.

Falls Between Long Hill Reservoir and Twitchell Distributing Reservoir

INTERNATIONAL COMMISSION RULES ON BOUNDARY WATER POLLUTION

The Board of Technical Advisers to the International Joint Commission on Boundary Water Pollution Investigation has completed its work on the St. Mary's River and the Lake Huron to Lake Erie section of these waters in the Detroit area.

Following the completion of the work the Board of Technical Advisers met in Cincinnati and drew up a statement of "Objectives for Boundary Waters Quality Control." This statement set forth as general requirements that "all wastes including sanitary sewage, storm water, and industrial effluents, shall be in such condition when discharged into any stream that they will not create conditions in the boundary waters which will adversely affect the use of these waters for the following purposes: domestic water supply, industrial water supply, navigation, fish and wild life, bathing, recreation, agriculture, and other riparian activities." The Board also listed the causes of adverse conditions, and set up requirements in more or less specific terms for adequate control of pollution.

The Board of Technical Advisers which consists of representatives from both U.S.P.H.S. and the Canadian National Health Dept., as well as representatives of the State of New York and the Province of Ontario, has shifted its activities to the Niagara Frontier. At a meeting held in Niagara Falls, Ont., on July 20th, the Board received statements and reports from local political parties which have been working on the problem of pollution of the Niagara River, Lake Erie, and Lake Ontario. Following the presentation of these published reports and current information, the Board decided to proceed with its Niagara River pollution studies in the area from Lake Erie to Lake Huron on both sides of the river. Studies made by the Buffalo Sewer Authority of the industries within the City of Buffalo and of the pollution of the Buffalo River will be accepted by the Board and no further studies of those particular sources of pollution will be made. Other industries along the Niagara River and other sewage outlets, however, will be investigated by the U.S.P.H.S., and the Dept. of Health of the Province of Ontario will make similar studies along the Canadian shore. Both departments will make studies of the stream itself. It is expected that this work will continue for at least a year and a half.

Iron and Steel Engineers to Hear About Water Works Maintenance

The topic of "Water Works Maintenance" will be presented as an address before the convention of the Association of Iron and Steel Engineers, by George H. Dann, engineer and general superintendent, Philadelphia Suburban Water Co., Bryn Mawr, Pa. Mr. Dann's paper is scheduled for the afternoon session of September 29th. The meeting will be held in Cleveland, Ohio, from September 28th to Oct. 1.

DISCHARGE COEFFICIENTS FOR WATER PIPE, THEIR PRESERVATION AND RESTORATION

By W. S. LEA
Consulting Engineer
MONTREAL

NOTHING in this article originated with the writer. It merely happens that being interested in the subject he has from time to time collected some relevant data, and finding it useful in his own practice, has published it on the chance that it might likewise prove useful to others.

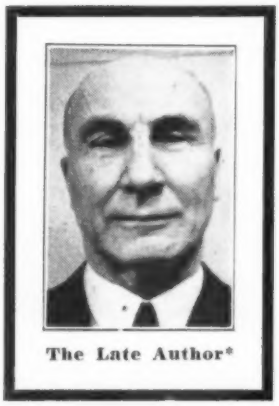
In 1933, a Committee of five was appointed by the N.E.W.W.A. to compile information on "Pipe Line Friction Coefficients." A summary of the report of that committee was published in the September 1935 issue of the Journal of the Association.

Since cast iron (c.i.) pipe is by far the most widely used type in waterworks practice, the Committee naturally collected the most of their data and made the vast majority of their tests on this kind of pipe. Moreover, since the Williams and Hazen (W-H) tables are in general use on this continent, the results of the Committee's tests on capacity loss after various periods of service were compared with the losses predicted in these tables. Also, the tests were made on pipes carrying soft and clear, but unfiltered, river waters as was the case for the W-H tables.

N.E.W.W.A. Conclusions

The Report states that the following general conclusions may be drawn from the data collected.

1. The average actual loss in capacity of tar-coated c.i. pipe after 30 years' service based on a total of 473 tests in 19 different systems was 52 per cent. The loss predicted in the W-H tables for mains of similar age and diameter (average 20.5 in.) and for average soft, unfiltered river water is 32.3 per cent. Otherwise expressed, even for these relatively large pipes it was found that the actual value of C (coefficient of discharge) dropped to 88 after only 4 years' service instead of after 30 years as predicted in the W-H tables.



The Late Author*

2. Based upon the data available to the committee, the W-H age-coefficient relation is applicable primarily to large diameter mains carrying relatively inactive water.

3. For small diameter mains carrying active water, the actual loss in 30 years may be twice the W-H predicted loss.

4. Other factors being equal the data show marked correlation between pH value of water carried and rate of capacity loss, average conditions reported indicating for supplies with a pH value of 6.5 twice the loss observed in supplies with a pH value of 8.0.

SUMMARIZED EFFECT OF pH VALUES OF WATER UPON CAPACITY LOSS AFTER 30 YRS. SERVICE

pH value of supply	Approx. average per cent capacity loss in 30 years
8.0	30
7.5	35
7.0	45
6.5	60
6.0	85

The Committee states that for practical use, the value of C may be taken as independent of the velocity.

Alkalinity and carbon-dioxide (CO_2) have an important effect on rate of capacity loss. Because of the interrelation between alkalinity, CO_2, and pH, this effect may be measured against the pH value alone. A typical numerical example may be given as follows: Water with an alkalinity of 10 ppm. will have a pH of 7.3 when 1 ppm. of CO_2 is present and a pH value of 6.3 when the CO_2 content is raised to 10 ppm.

Williams-Hazen Tables

Since the W-H tables for friction loss in water pipe will be referred to repeatedly, the following extracts from the Introduction to these tables is for convenience presented here.

"Over the column for C = 140 are placed two zeroes in a circle (00). That indicates that this coefficient is obtained with the very best new c.i. pipe laid perfectly straight. Over C = 130 is placed one zero in a circle (0), and this is the value that can be fairly counted on for good new c.i. pipe. Over the following columns are placed figures in circles. These figures show the age in years at which, on an average, as nearly as we know, c.i. pipe will reach the values given in the table underneath. It must be understood that these are necessarily very rough approximations, based on the best data available, which are principally for soft and clear, but unfiltered river water. Hard waters and lake waters will often attack the pipe less rapidly, and the figures must then be increased. Sometimes they must be multiplied by two or more. Other waters will corrode the pipes more rapidly than the average, and for these the values will be reached more quickly than the figures indicate. The divergence with different castings and with different kinds of water is greatest in the smallest pipes, and no attempt is made to extend the figures in the circles to the sizes below 4 in. in diameter."

It is further stated in the Introduction that: "the value indicated for C for new riveted steel pipe with in-and-out joints is 110 decreasing in about 10 years to 100. For older pipes as far as present data go, steel pipe of a given age will carry the same quantity of water as c.i. pipe of the same size

*This paper was written by Mr. Lea only a short time before his passing on July 5, 1947.—Ed.

and ten years older. For smooth wooden pipe or wooden-stave pipe 120 seems a fair value for C. For masonry conduits of concrete or plastered, with very smooth surfaces, when clean, values of C = 140 may be observed. But allowing for slime coatings and for ordinary good work a value of C = 120 may be conservatively adopted."

In comparing the values of C for new and old pipe, it is obviously more convenient to express the loss with age if any, by giving the values of C for both, rather than by expressing the capacity of old pipe as a percentage of the capacity of new pipe. It was, therefore, necessary for the Committee to first of all adopt a value of C for new c.i. pipe. To this end, they studied many relatively reliable tests of the capacities of 18 c.i. pipe lines from 16 to 48 in. in diameter (averaging 26.3 in.), ten of which were new and the other eight under 18 months old, finding an average value for C of 133, but since many of the lines had been in use for a year and more, 135 was adopted for supply and transmission mains 16 in. and over, well laid on relatively straight horizontal and vertical alignments.

This value was further justified because it was intermediate between the W-H assumption of C = 140 for the very best c.i. pipe laid perfectly straight and of C = 130 as the "value that can be fairly counted on for good new c.i. pipe."

For distribution mains smaller than 16 in., with allowance for tees, valves, bends, corporation cocks, or other specials, involving friction losses, a value of C = 125 was adopted, based on 6 tests of new pipe from 4 to 8 in. in diameter.

The N.E.W.W.A. report points out that no single value of C can cover the range even in the case of new pipe and variations possibly approaching magnitudes 10 per cent higher or lower than the values adopted by the Committee may be found in extreme cases. They further point out that while the data were in no way restricted to sources affording "laboratory" precision, they were reasonably precise.

Causes of Capacity Loss

Causes of capacity loss in c.i. pipes other than tuberculation are incrustation, slime, fungus growth, and silting. Of these, incrustation is perhaps the most frequent. It may be associated either with precipitation from solution of natural mineral matter dissolved in the water, or with precipitation subsequent to chemical changes associated with water treatment.

The use of lime to raise the pH value in the corrective treatment of water for the reduction of tuberculation has frequently resulted in the incrustation of mains, services and meters.

Incrustations have occurred where lime and ferrous sulphate have been used as coagulants coincident to the maintenance of relatively high pH values.

The third condition under which water treatment has resulted in incrustation of pipes is associated with the lime process of softening.

An example of serious capacity reduction by incrustation following the adoption of the lime-soda process for water softening may be cited where 23 tests on pipe lines in the system with a weighted average diameter of 23.2 in. showed a capacity loss of 64.5 per cent after 30 years' service. Whereas the W-H predicted loss for a 24 in. pipe is 31.5 per cent. The pH value of the water was approximately 9.

The N.E.W.W.A. Report refers to a loss in capacity due partly to slime at Utica, N. Y. and to a loss at Rochester, N. Y., due to a growth of fresh water sponge.

About 35 years ago, the writer recommended to the City of Three River, P. Q. a system of shallow wells driven in sand along the bank of the St. Maurice River. At that time, this City had no filter plant and was using St. Maurice River water which besides being polluted carried a great deal of waste from upstream pulp and paper mills. The organic content of the water in time, however, reduced the ferric compounds in the sand through which it passed to the wells to soluble ferrous compounds which resulted in the growth of crenothrix which plugged the house services.

In its letter of transmittal the N.E.W.W.A. Committee recommends the formation of a Joint Committee with the A.W.W.A. to extend the scope of the Report. Frequently by a little foresight in design and at minor expense many individual engineers could implement this recommendation in their own work.

Preservation of Capacity

Mention is made in the report of the corrective treatment of corrosive water by lime, sodium hydroxide, or soda ash, but it does not appear that such treatments can be effectively controlled for general use.

In the United States, cement lined c.i. pipe is available from the large foundries. The cost is not high, 8c per ft. for 6 in.; 44c per ft. for 24 in.; and $10.00 per ton for 6 to 24 in. fittings. All waterworks engineers will be familiar with the "American Standard Specifications for Cement Mortar Lining for Cast Iron Pipe and Fittings," Dec., 1939.

It may be noted that although optional in the specifications, it is advisable to white wash the outside surface particularly of the larger sizes if they may be exposed to a hot sun for some time before laying. Another optional procedure is to provide a bituminous seal coat which helps the curing of the lining by minimizing the evaporation of moisture besides minimizing the leaching of the lime from the mortar.

W. W. Brush, when engineer of the Water Department of New York City, was the first on this continent so far as I am aware, to specify a bituminous seal coat. He did this of his own accord in 1930, but tells me that he later discovered they had developed this practice in England 5 years earlier.

The minimum standard thicknesses specified are as follows: ⅛ in. for 4 to 12 in. pipes; 3/16 in. for 14 to 24 in., and ¼ in. for 30 to 48 in. Assuming the same value of C for the pipes before and after lining the writer finds (by slide rule) the capacity of the lined pipe varies from 89.5 per cent of the unlined pipe for the 6 in. to 97.5 per cent for the 48 in.

In 1901 the writer was in the employ of the late Freeman C. Coffin of Boston, who designed the Chatham, N. B., water system. At that time there was some uneasiness about the use of lead pipe for house services, because of the reports alleging lead poisoning in some New England cities. As the Chatham supply was for the most part a soft, unfiltered water, drawn from an uninhabited watershed, Mr. Coffin specified cement lined wrought iron pipe for services. My recollection is that ¾ in. pipe was used, lined to ⅝ in. using Rosendale, a natural cement. The writer was left there over the winter to look after the job which cost around one cent a foot. (Of course, none of us received much pay.) I realize now that the lining was not properly

cured, but when last heard of about 10 years ago, the services were still giving excellent satisfaction. The cement people tell me they could now furnish a better cement for the purpose.

The N.E.W.W.A. Committee states that data covering the value of C for c.i. pipe, lined in the foundry by the centrifugal process, is limited. They believe, however, that with the best workmanship C will vary from 145 to 150 based on actual net diameter. One test was available for the "stove pipe" type of cement lined wrought iron pipe after 41 years' service which gave 104 for C. Considering the method of lining, followed by early practice, this test would seem to support a high and lasting value of C for pipe as presently lined.

Insofar as I am aware, cement lined c.i. pipe is not yet available from Canadian foundries. Two reasons for this, presumably, are that many of the larger cities draw their supplies from the Great Lakes and the St. Lawrence River, both of which are relatively inactive waters.

The N.E.W.W.A. Committee states that there is scant information available on values of C for c.i. pipe with centrifugally applied Bitumastic-Enamel lining. The thickness is usually 3/32 in. According to the report, the information available from several tests on four pipe lines indicates that the value of C based on nominal diameter will approach the magnitudes tabled below:

Supply and Transmission Mains 16 in. and over	C
Best conditions—straight line and grade	160
Worst conditions—many bends winding route	145
Average conditions	155

Distribution Mains under 16 in.	C
Best Conditions—few branches, few services, straight alignment	150
Worst Conditions—frequent branches, services and specials	140
Average Conditions	145

The first pipe with bitumastic enamel lining centrifugally applied was made in 1931. This kind of lining was first applied by the hand-brushed method. Visual inspection by the Committee of a number of large steel lines so lined has shown no deterioration apparent to the eye within a service period of 16 years.

RESTORATION OF PIPE CAPACITY

The capacity of tuberculated c.i. pipes in place can be restored by scraping and lining with cement mortar or with a bituminous mixture.

Scraping the pipe if properly done will in itself restore between 80 and 90 per cent of its original carrying capacity. If not relined or re-coated, however, the loss in capacity following the scraping often proceeds at an accelerated rate, besides causing discolored water.

Cement Lining

Small c.i. pipes are lined by what is called the Tate process developed in Australia. It is essential to the success of the Tate or any other method which may be adopted for lining c.i. pipe that the pipe be thoroughly scraped and flushed out in advance. In the Tate process a 1:2 mortar is used. Ciment Fondu is the most suitable for the purpose because it sets more quickly than other cements, permitting the return of the main to service in 12 hours or less, and because it has only a slight effect on increasing the hardness and pH of the water immediately after the water is turned on again. In the Tate process the mortar is fed into the pipe and a plunger slightly smaller than its inside diameter is pulled through it. As the formation of the lining develops a pressure of about 130 lb. per sq. inch, an exceptionally dense lining is produced.

In one instance, in which a corporation cock was not closed, the mortar was forced through 54 ft. of ¾ and ½ in. lead service before being arrested at the house tap. The entire operation of cleaning and lining 450 ft. of pipe up to 6 in. in diameter was 24 hours.

Thomas H. Wiggin, Consulting Engineer, New York, N. Y., in Vol. 27 of the *A.W.W.A. Journal* states that tests made of Tate lined c.i. pipe carried out under his direction at Manchester, England, showed the following values for C, based on actual inside diameters: for 3 in., 152; for 4 in., 142; and for two 5 in. lines, 152. These values seem fairly high, compared with 135 to 140 for the best c.i. pipe laid perfectly straight, but no doubt the fact the lining makes a continuous surface with no inequalities at the joints, may account for some of the improvement.

The Tate Co. did the scraping and lining only, receiving 29c per ft. The linings were from 5/16 to ⅜ in. thick. Mr. Wiggin intimates that he thinks they could be made thinner to improve the values of C based on nominal diameters.

Pipes which are large enough for men to work inside are lined in place by cement mortar centrifugally applied from a motor driven machine pulled along inside the pipe. The City of Montreal let a contract last year to the Centriline Corp. of New York to line 7 miles of 48 and 36 in. steel pipe. This work was described by F. Y. Dorrance of the Montreal Water Board at the Convention of the Canadian Section of the A.W.W.A. held in Montreal in April, 1947.

Referring now to the lining of pipes with a bituminous mixture, the U. S. foundries the writer has been in touch with all expressed the opinion that the work of lining new pipes with bitumastic enamel should be done on the job. As mentioned above it is stated in the N.E.W.W.A. report that bitumastic lining has been applied both centrifugally and by the hand brushed method. Presumably if bitumastic enamel lining must be done on the job its use is limited to the larger sizes, certainly not smaller than 24 in., unless the company itself does the work. None of the foundries indicated the reason for their objection to lining at the foundry but as a guess one would infer trouble with the lining when subjected to fairly high or low temperatures.

Some years ago the writer had occasion to cut into a 22 in. B&S Scotch pipe which had been in service 35 years carrying a lake water. It was a clear water and I imagine fairly soft, although it had not at the time been analyzed. The interior lining was fairly thick, fully 3/32 in. and it was in perfect condition, glossy, tough and tenacious. The outside of the pipe was protected by burlap impregnated with bitumen which was also in fine shape except the upper third of its periphery which was damaged apparently by frost action.

Eric Process

Another method of coating pipe in place with a bituminous mixture has been used extensively in England since 1929. It is known as the Eric Process. In the case of the smaller sizes, a section of main from 400 to 600 ft. in length is isolated, and after scraping and flushing, the pipe is filled with an electrolyte in the form of a bituminous solution. A copper cylinder 18 in. long smaller than the pipe and insulated therefrom is placed in the pipe and connected with one terminal of a 110 volt D.C. portable generator,

the other terminal of which is connected to the pipe. When the power is turned on the bitumen is deposited on the pipe wall until every bit of it contiguous to the cylinder is coated. The completion of the coating is apparent on the ammeter in the circuit which reads around 20 at the start dropping to ½ ampere or less at the end. The cylinder is then pulled ahead and the operation is repeated until the whole section is finished. For the larger sizes the pipes are not filled with the solution which is fed through a hose into the annular space around the cylinder.

The coating has no effect whatever on the water and is harmless, tasteless and odorless. The pipe can be returned to service just as soon as the solution is drained or pumped out of the main and the closures are made. There is no need to shut off anything except the taps on the house services. As the solution is miscible with water, standing pools of water in the pipe merely dilute it slightly.

Obviously the cost is much less than for a cement lining. For scraping and coating, the corporation taking care of everything else, the price per foot paid to the Eric Company by one corporation works out at 25c for 3 in.; 29.2c for 4 in.; and 33.3c for 5 in. pipe. Another municipality for the same service paid the company 14.57c per ft. for 7 in.; and 13.88c per ft. for 3 in. to 6 in. The company states that the costs for sizes smaller than 6 in. are substantially the same as for 6 in.

The writer first heard about this process from S. A. McWilliams of Toronto, who held the Canadian rights, and in 1937 wrote the engineers of 13 English cities, all of whom reported that so far the pipes, scraped and coated by the Eric Company, seemed to be maintaining their capacity. In 1945, the writer repeated his questionnaire, and received the following information: One City reported examining several mains which had been coated 7.5 years previously and found slight signs of nodular growth. They believed the treatment had added from 15 to 20 years to the useful life of the pipe. Another City considered the treatment good for 10 years. One large City reported that a pipe coated in 1929 was slightly incrusted but on the whole the coating had remained intact when examined in 1945. Another City reported the coating good after 13 years.

Another City using moorland water which the writer understands is a very active water, estimates a useful life of 5 years for c.i. pipes treated in place by the Eric Process. It is realized that the periods reported above for the so called extension of the useful life means that a pipe of inadequate capacity would be rendered fit for its intended purpose for the periods stated without of course implying that its restored capacity remained unimpaired during these periods.

From the above information it appears that the Eric treatment is not so lasting as a cement lining, but further observation is warranted. For supply and transmission mains in place, whether large or small, the writer prefers cement lining provided it is economically practicable to maintain a reasonable service while the work is in progress. However, in the case of the smaller sizes of distribution mains, usually laid beneath paved surfaces and usually with service connections at frequent intervals, the Eric Process is well worth considering.

A case in point could be cited where an Engineer may know that in a matter of 10 years more or less a badly tuberculated main will have to be replaced either because of age or inadequate size. In such a case, the Eric treatment might well serve the purpose where the cost of cement lining would be out of proportion to the benefits received.

The cities the writer contacted had used the process with small sizes only, 10 in. and under. In the Eric catalog, however, there is shown a photograph of an "Electrode for re-coating pipes which can be entered." Moreover, Mr. McWilliams, in an article in the *Engineering and Contract Record* of April 4th, 1934, states that "the Eric Process can be used on mains from 2 in. up to any size made."

Steel Pipe

The N.E.W.W.A. Report states that the most complete data available in connection with steel pipe will be found in Bulletin 150, January, 1930 of the U. S. Dept. of Agriculture, by Mr. Fred C. Scobey. Even in this bulletin, data covering the effect of age is limited.

The values of C for new steel pipe from this Bulletin is as follows:

Full Riveted Pipe

Sheet metal pipe up to 3/16 in. thick for 6 in., C = 130; for 30 in., C = 120.

3/16 to 7/16 in. plate with taper on cylinder joints for 30 in., C = 110; for 120 in., C = 100.

½ in. and up plate with either taper or cylinder joints and ¼ to 7/16 butt jointed plate, C = 100.

Butt strap plate, ½ in. and up 10 ft., C = 95; 24 ft., C = 90.

Girth Riveted Pipe

Lockbar and hammer weld pipe with lap or flange-riveted joints; electric weld, hammer weld, and drawn pipe with riveted pump joints, C = 125 to 130.

Continuous Interior Pipe

All types sheet and plate metal pipe with a practically uniform interior surface of relative smoothness. Full welded, crimped slip joint, lockbar with welded flange or leaded sleeve connections, bell and spigot, and bolted coupling pipes all belong to this class. *C* for 30 in. and under = 140, *C* for over 30 in., = 130.

Miscellaneous Special Types of Pipe

Spiral riveted, flow with laps, C = 110; spiral riveted, flow against laps, C = 100.

Dredge pipe with clear water, dredge pipe with dredged materials, C = 110 to 130.

Corrugated pipes, C = 60.

Wood Pipe

The N.E.W.W.A. Report does not refer to woodstave pipe at all. The writer refers to Bulletin 376 of the U. S. Dept. of Agriculture, on "The Flow of Water in Wood-Stave Pipe" by Scobey. In his conclusions, p. 76 of the Bulletin, Scobey states that existing data do not show that the capacity of wood stave pipe either increases or decreases with age. That woodstave pipe will carry about 15 per cent more water than a 10 year old c.i. pipe or a new riveted pipe and about 25 per cent more than a c.i. pipe 20 years old or a riveted pipe 10 years old. This would appear to represent values of C ranging from 125 to 130 for wood pipes from 12 to 60 in. in diameter.

In 1905, the writer was assistant engineer on the construction of a gravity water supply for Saint John, N. B. designed by the late F. A. Barbour, Boston. Part of it was a 33 in. California redwood pipe, and this pipe was initially so smooth that one would infer for it a value of C approximating 130.

Cement Asbestos Pipe

The N.E.W.W.A. Committee did not mention another kind of pipe which the writer considers competitive with cement lined c.i. pipe, where active water has to be carried viz: "Transite" Pipe. It possesses a very smooth interior surface and when new would appear good for a coefficient of discharge of better than 130.

Concrete Pressure Pipe

To complete the list there is the Lock-Joint Pipe and the pipe made by the Pressure Pipe Company in Montreal. These pipes consist of a welded steel cylinder with steel joint rings welded to its end. The cylinder is lined with spun concrete and surrounded on the outside with vibrated concrete enclosing a cage of spiral wound and longitudinal steel bars. The cylinder ensures the water-tightness of the pipe barrel and the spiral winding, together with the cylinder, gives it its strength. The joints are made by rubber rings or fibre filled lead rings flattened as the gaskets are rolled into the tapered annular space between the joint rings. Presumably the value of C for these pipes would be as high as for c.i. pipe lined in the foundry with a centrifugally applied cement mortar lining. Montreal has been using steel cylinder cement pipes in sizes from 16 to 48 in. since 1932, and has recently rejuvenated a number of miles of the old steel main by cement lining it in place by use of the centrifugal method of applying the cement mortar.

King Praised for Water Supply

50 Mile Pipe Line for the Mecca-bound

The 30,000 inhabitants of the picturesque walled Red Sea port of Peddah are singing the praises of King Ibn Saud of Saudi-Arabia, as they queue up to draw their free water supply from recently installed taps. The town is built on land reclaimed from the sea and its people, as well as the thousands of Mecca-bound pilgrims who pass through, have had to drink distilled sea water, flat and insipid. Now a 50-mile pipeline brings fresh water from Wadi Fatma.

Penn State Offers Short Courses

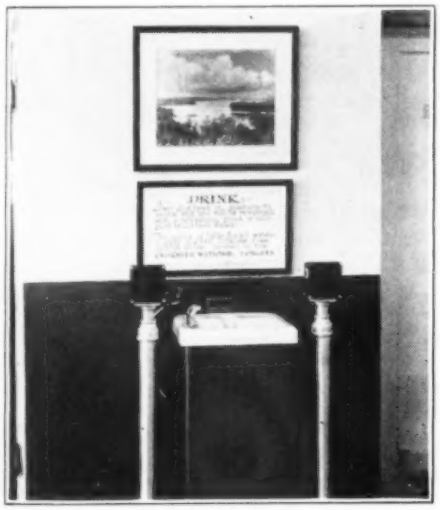
Pennsylvania State College, State College, Pa., offered two short courses to the sewage and industrial waste treatment plant operators and superintendents in June. In October the college will offer a short course for water works superintendents and operators.

The short course was given by the offices of the college sanitary engineering staff, and sponsored by the Penna. Sewage and Industrial Waste Assn., the Penna. State Dept. of Health and the college. The first course was designed to meet the needs of new operating personnel and operators with some experience but little training. The second course was for experienced operators who have had formal training, and a third course to be operated next year will require successful completion of the second course. Certificates were awarded to those completing the courses, which were given not only by members of the college staff but also by guest lecturers drawn from equipment supply mfg. companies, consulting engrs. and the Dept. of Health personnel.

Robert E. Stiemke, Prof. of Sanitary Engineering, is in charge of the short courses. The next session will be for water works operators and superintendents, and will be held under the sponsorship of Penna. State College and the Pa. Water Works Operators' Association. This meeting will be held in early October.

More Little Rock Public Relations Advertising

In the May issue of *Water & Sewage Works* there appeared a story with photograph of some excellent public relations work being done by L. A. Jackson, Manager-Engineer of the Little Rock, Ark., Municipal Water Works.



In that item was shown the display used at the Fairgrounds at a Chamber of Commerce exhibit.

Now comes another photograph from Mr. Jackson showing a further bit of public relations advertising. The accompanying photograph shows an electric eye drinking fountain recently installed in the Little Rock Municipal Airport Administration Building. The Board of Water Works Commissioners contributed this installation at a total cost of approximately $450.

"Besides being a most practical gift," Mr. Jackson writes that, "it creates widespread interest for the many thousands of out of state visitors and is very good publicity to say nothing of the local public relations advantages." The Municipal Water Works has the same type of installation in the office lobby where it has been in operation for about eight years.

Northwestern Section Illinois Operators Meeting

The Northwestern Section of the Ill. Waterworks Operators held its mid-year conference at Dixon, Ill., on July 14. A large registration was present as the guests of Glen F. Coe, Manager of the Dixon Water Co., to hear a talk on "The Well Driller & Municipal Water Supply," by Wm. A. McElhinery, Pres., J. P. Miller Artesian Well Co., and on "The Stability of Water," by J. G. Weart, chemist, Ill. Dept. of Public Health.

The inspection trip included the Dixon Water plant and several industrial plants. Chairman of the section is Cliff Moomau, Manager of the Northern Ill. Water Corporation and the secretary is H. S. Merz, Water Superintendent of Rockford, Ill.

Purdue's 4th Industrial Waste Conference

The Fourth Industrial Waste Conference of Purdue University will be held on September 21 and 22. The program plans to present papers and discussions covering the newest development in waste utilization and disposal practice. There will be special sessions on food processing, dairy manufacturing, fermentation processing, oil refining, metal plating, paper manufacture, chemical manufacture and others. Attention will also be given to analytical methods for both character and toxic quantities of the various waste materials.

Further information on this waste conference and hotel accommodations may be obtained from the chairman of the conference, Prof. Don E. Bloodgood, Civil Engineering Building, Purdue University, Lafayette, Indiana.

DIGESTION OF SEWAGE SOLIDS

A Review of Established Methods; Comparisons and Comment

HEATED SLUDGE DIGESTERS

Features of Design ‡

The Fifth Article of a Series

by
LeROY W. VAN KLEECK
Sanitary Engineer*
HARTFORD, CONN.

A DIGESTION tank is like a railroad station—something is continually arriving or departing. Digesters might be considered as the "social hub" of a sewage plant, receiving raw solids (mixed company indeed), displacing liquor, producing gas, liquefying colloidal matter, breaking down the volatile solids to fixed solids, and concentrating digested solids for removal. Is it any wonder over-worked digesters spout foam, discharge sick looking (and sometimes sick smelling) sludge or yield gravy-like supernatant liquor?

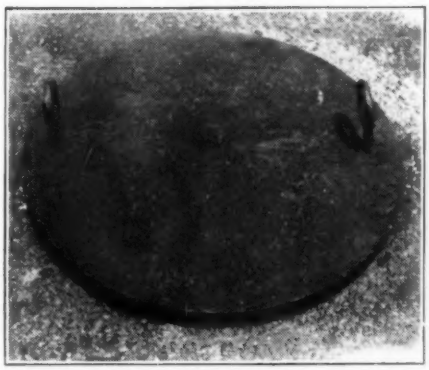


Fig. 1—Heavy-lid Type of Manhole Cover, Such as Used at Torrington, Conn., Has Several Advantages.

*Connecticut State Dept. of Health.

‡A continuation of the discussion of Type of Lay-Out and Features of Design in *Water & Sewage Works*—July 1948.

Required Capacity

What is an overworked digester? Opinions vary, but most designers and operators agree that past capacity allowances need liberalizing. A reluctance to raise digester capacities stems from a desire to hold down plant costs. Such economy may be short sighted, however, when nuisance or operating difficulties result. The capacities given herewith are based on the cu. ft. of liquid volume per equivalent capita served. Equivalent per capita allowances embrace the load contributed by industrial wastes as well as the actual connected population. Unless the sewage to be treated is unusually strong or has other abnormal characteristics, per capita allowances appear to be a sound basis for design. The dependability of such allowances leans heavily, however, on the accuracy of population estimates and a careful survey of the character

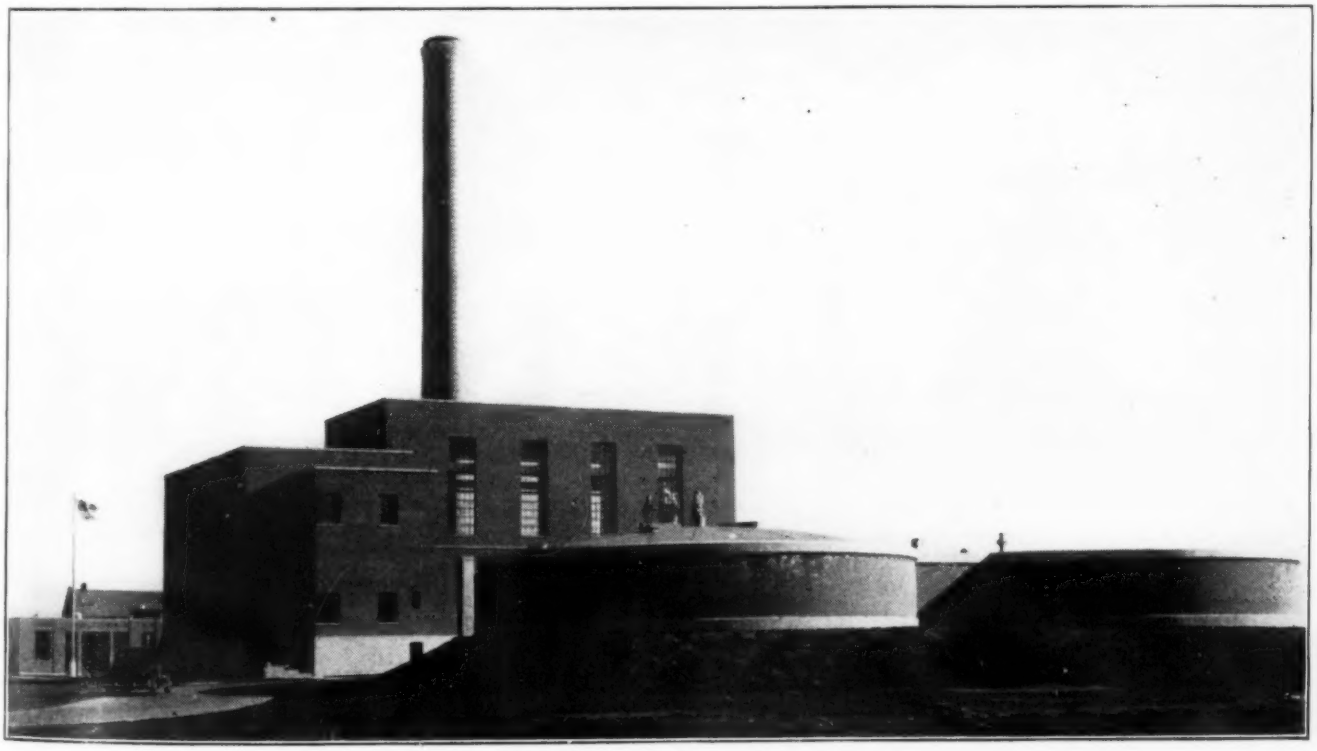


Fig. 2—The New London, Conn., Plant.
An example of insulated digesters with brick jackets.

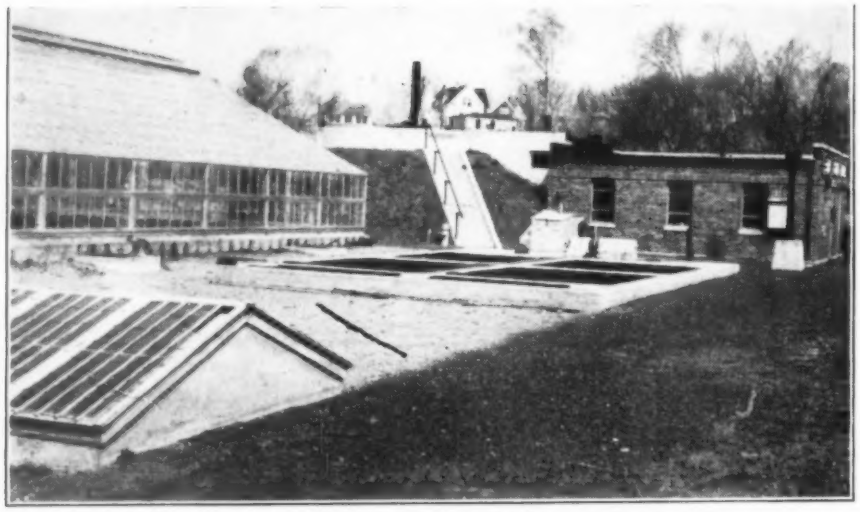


Fig. 3—The Compact Plant of Norwich, Conn.

The operating building being built against the wall of the digester, provides an economical digester operating gallery.

and quantity of industrial wastes to be handled.

Rankin[a] has recently suggested that the volume of digesters might be based on the volume of raw sludge input and its detention in the digester. These factors he finds are based on a study of annual reports of operation at existing plants, and bear a close relation to tank performance as measured by volatile matter reduction. He observes that digesters having detention periods of less than 30 days experience supernatant trouble, while those with 60 days or more detention seem to have no troubles. Between these periods the data are inconclusive. This basis for design would appear to warrant careful study, but without supporting operating data the volume of raw sludge to be handled may vary considerably from estimates, thus making the required digester volume a difficult decision in designing new plants.

SUGGESTED CAPACITY ALLOWANCES IN DIGESTERS FOR CONNECTED EQUIVALENT POPULATION

Type of Sludge	Cubic Feet per Capita	
	Minimum	Preferable
Primary	2.0	2.5 to 3.0
Primary and humus	2.5	3.0 to 3.5
Primary and activated sludge	4.0	5.0

Allowances appreciably below the minimum figures of the table will usually result in one or more operating difficulties.

Control Galleries

The first digestion tanks were often built with either the control valves and connecting piping buried in the ground near the tanks, or located in a deep chamber adjacent to the tank. Being accessible only through a standard manhole with cramped interior quarters, these chambers created an occupational hazard. Control galleries at or near grade level, built between and adjacent to the tanks, furnished ideal housing for these valves and pipes, as well as for sampling sinks, sludge temperature thermometers, recirculating pumps, sludge pumps, gas compressors, and a portion of the sludge gas safety devices—in particular the main gas meter, waste gas meter, flame trap and pressure regulator for the waste gas line and the condensate traps.

Control galleries should be well ventilated by natural draft or mechanical exhaust or both. Non-sparking motors, explosion-proof switches, wiring and lighting fixtures should be specified. The design should conform with the requirements of Article 32 of the National Electric Code for Class A hazardous locations.

Sampling Sink

A sampling sink in the control gallery enables an operator to obtain samples from various levels in the digesters with a minimum of effort, and independent of outside weather conditions—(see Fig. 5). They also provide, as has been previously mentioned, a convenient and inexpensive means for the slow return of supernatant overflow liquor to the raw sewage. Soundings made with sludge samplers or pitcher pumps from manholes in the covers of digesters involve laborious and messy work.

The sink should be at least 18 inches deep, ample in area, and furnished with water or effluent under pressure for back-flushing clogged sampling pipes and for rinsing. No cross-connections between such flushing water and any potable water supply should be made. The sampling pipes, tapped from the supernatant and sludge draw-off pipes on the digester walls, should terminate over the sink. The pipes should have a minimum diameter of 1¼-in. to reduce clogging with heavy scum. Wrought iron or brass pipe is generally used. A numbering system, color scheme or other identification for each sample pipe is a convenience. The pipes should have threaded ends for attaching a back-flushing hose, or the back-flushing water can be individually valved to each sampling pipe behind its quick-opening sampling valve.

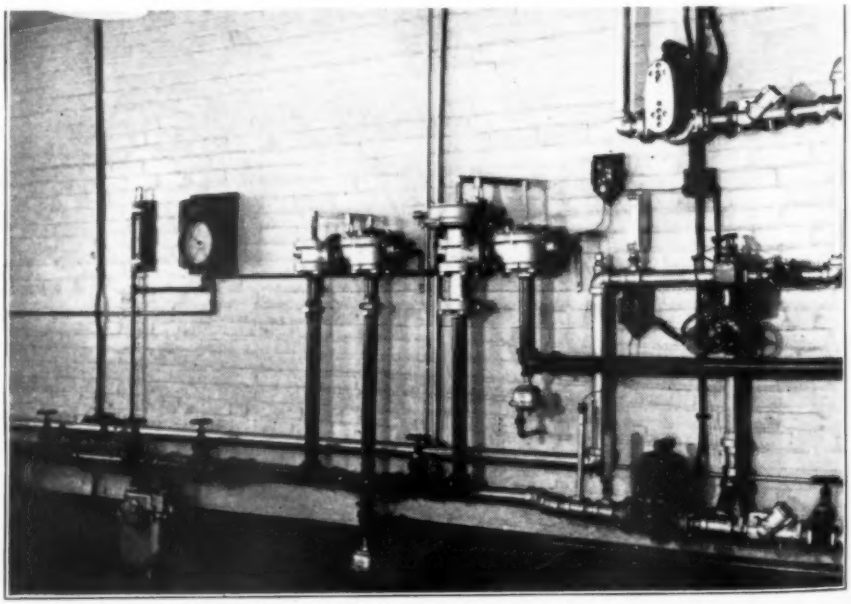


Fig. 4—Example of Well Laid-Out Modern Gas System.

Note meters, flame traps, pressure regulator, pressure gage, condensate traps. Also shown is part of the hot water circulating system to digester.

[a] *Sewage Works Journal*, May 1948, Vol. 20, No. 3, p. 478.

These sampling pipes are frequently taken off the digester supernatant and sludge draw-off pipes between the digester wall and the controlling gate valves. Samples are then procurable without opening and closing the large valves. This arrangement, however, places the digester hydraulic head on the quick-opening or small gate valves at the sink end. Although with good workmanship no difficulty may be experienced for some years, it is advisable to place a small gate valve on the digester side of these sampling lines. Then if the sink valve breaks or cannot be shut tight, or a complete clogging of the sampling pipe has occurred, the line can be closed, disassembled and repairs made. Taking off the sampling pipes beyond the large digester piping valves is another solution, but this requires opening of several large valves when sampling various levels of the tank.

Supernatant Draw-Offs

Every digester should be provided with at least two supernatant overflow liquor levels and preferably three or four. One leading sanitary engineering firm designs its digesters with decanting pipes practically the entire depth of the tanks at intervals of 2 to 3 feet. A waste of money? Not if you have a supernatant or scum problem! Secondary digesters connected for series operation are an exception, although even these should have two top overflows about 3 or 4 feet apart in case of scum clogging. Both supernatant and sludge piping from digesters should be not less than 8-in. in diameter. Valves not accessible from the control gallery floor can be operated by a wheel-and-chain mechanism—(see Fig. 5).

In recent years a patented device for drawing off and selecting the best supernatant liquor has been developed. By its use, conventional supernatant draw-offs are considered unnecessary, but the device needs further demonstration at sizeable municipal installations. In any event, several conventional draw-off pipes are still desirable for the removal of scum, as discussed further on.

Disposal of Supernatant

Although the volume of overflow liquor in the average separate sludge digestion type plant is only 0.2 to 0.3 percent of the total sewage flow, and will run around 2000 gallons per million gallons of sewage treated (this provides no allowance for sludge pumpings from secondary treatment processes), even such a moderate return to the raw sewage flow at the smaller treatment plants is frequently a major operating problem, because of the reduced dilution afforded by the *instant hourly flow* at these plants.

Erickson[2] in an excellent paper on "Treatment and Disposal of Digestion Tank Supernatant Liquor" presented by Langford before the New England Sewage Works Association stated in this connection:

> "Despite the exercising of care by plant operators to draw off only the best liquor, it is usually still high in solids, great in volume and it imposes a heavy B.O.D. and solids load on the portion of the plant to which it is returned. Due to its high B.O.D. and solids content and probably to the specific nature of its bacterial flora, supernatant liquor has a tendency to cause disturbance of the primary settling tanks. This causes a sludge of higher moisture content to be transferred to the digester and results in a greater volume of supernatant liquor to be returned. Thus a self-pyramiding cycle is set up."

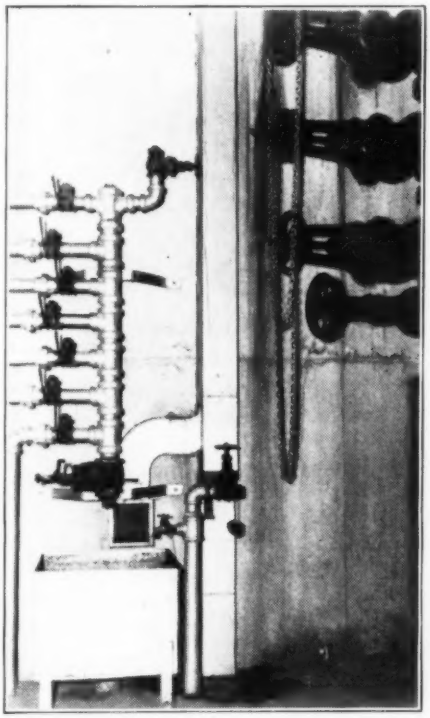


Fig. 5—Section of a Digestion Tank Operating and Control Gallery.

Note digester contents sampling and supernatant zone finding lines, and sampling sink on left. On right is the battery of supernatant draw-off valves and lines, the upper valves being operated by chain pull.

In addition to these remarks it should be pointed out that digester overflow liquor has a high chlorine demand, which requires an increase in the chlorine dose for satisfactory sewage disinfection, odor control, and other chlorination processes.

For these reasons it is desirable, particularly at small and moderate sized plants, to provide in the design for one or more alternate methods of supernatant disposal. Suggestions follow:

1. Return to the raw sewage is the commonest method of handling. The liquor should be returned at a slow rate to *all* of the sewage flow to obtain maximum dilution. Return rates should be kept low by providing means for drawing supernatant through small sampling sink draw-off valves instead of the large valves on the digester supernatant piping. This method of removal is also suggested for unheated separate digesters. At least one manufacturer has a rate control device for slow and constant rate withdrawal of supernatant.

2. Discharge to the sludge drying beds or lagoons with subsequent filtering. By proper operation this is a very practical method of handling supernatant liquor at small plants. Odors can be controlled.

3. Pre-settling in abandoned septic or Imhoff tanks in re-built plants (see comments under "How Many Tanks" in the previous installment) or in special settling tanks. After pre-settling, the effluent should be returned to the raw sewage.

4. Patented treatment processes such as atomized aeration and settling.

The writer having had no experience with the last named installations is unable to report on them at this time.

Tank Cover Manholes

In addition to the usual small 6-in. manhole covers over sounding entrances for scum or sludge or for temperature readings, and the inspection manholes for heat exchangers, stirring equipment and gas domes, 24-in. diameter manholes should be provided for cross-circulation of air when a tank is entered, and for access to tank scum. These large manholes should be at least four in number. One manhole should be directly over the supernatant piping. Another should be at the opposite side of the cover and near the tank wall to serve as a means of access to manhole rungs down the tank's interior wall. The other two should be 5 or 6 feet in from the periphery of the cover to provide greater access to the scum and should be spaced opposite each other and equidistant from the other two manholes.

There has been a lot of discussion of scum in this series. Scum accumulations are a real problem in separate sludge digestion tanks. Control of this scum has not been completely solved, except that properly designed and operated water sprays, or slow-

[2] *Sewage Works Journal*, Sept. 1945, Vol. 17, No. 5, p. 889.

Fig. 6—A Digester with Fixed Cover.

Is equipped with five manholes for access to scum, only four of these showing however. Note the heavy manhole lid shown at close range in Fig. 1.

stirring types of scum mechanism are usually successful controls.

Some engineers have installed elaborate piping lay-outs under the roof of fixed cover digesters for scum control. Supernatant is pumped with a recirculating pump to nozzles in this piping. From these nozzles the heated supernatant under high pressure is sprayed over the scum, softening and sinking it. If properly designed *and regularly used* by the operator, scum build-up should be effectively prevented.

Until the newer controls are tried and proven, the writer suggests more manholes on digester covers. Then if scum does accumulate, it can be broken up with water or sewage or supernatant under pressure through the four manholes described above. The scum can then be drawn off to vacuum filters or sludge beds in a fluid condition through the flexible supernatant draw-off piping already recommended. The writer has seen as much as 5 feet per day of heavy scum removed from digesters by this method. Granted, the method will not prevent a scum build-up, but if a scum accumulation defies settling by heating or other means, this method affords a sure means of removal. The manholes normally furnished with prefabricated digester covers will prove insufficient in number for scum removal by this method.

A unique type of manhole cover is pictured in Figure 1. This cover, weighing about 400 pounds, sets on a gasketed rim without fasteners and its weight is depended upon to prevent the escape of gas. It is easily removed by inserting an iron bar through the manhole cover rings, and lifting it to one side by leverage action. Such manholes are also a safety precaution as undue pressures caused by gas pipe stoppages, closing of supernatant valves, etc. will be relieved at the manholes rather than causing structural damage to the cover, the flooding of gas pipes with liquor, or other harm. The manhole illustrated is one of a number installed at Torrington, Conn.

Importance of Tank Insulation For Northern Climates

Many of the early digesters were poorly insulated. High ground water around a digester, as well as poorly constructed walls and covers, will cause heat losses.

To avoid ground water the tank can sometimes be built mostly above ground, a dry location can be sought, or drainage tile employed. Earth embankments around digester walls are not too efficient insulators, tend to settle, and are hard to keep attractive. For operators who tire of attempts to maintain trimmed grass on such embankments, the planting of honeysuckle is suggested. This grows easily, makes a dense cover, ordinarily requires no spraying, pruning or special maintenance, and yet holds the earth and looks fairly presentable.

Figure 2 shows two digesters built with insulated brick walls to retain the tank's heat. Various wall materials are being used in the newer tanks, including brick, concrete, or stucco over hollow blocks or tile, and with insulation provided by air spaces, rock wool, aluminum foil or other suitable materials.

Tank covers also need better insulating. Winter readings made by the writer with a maximum recording thermometer have shown differences of 10° to over 20° F. between the sludge zone and scum zone in many tanks. Much heat loss was apparently occurring through the tank covers. Cold scum digests slowly and this fact is undoubtedly a factor in its more rapid build-up in winter.

Gas Collecting System

The recommendations of the Sewage Works Federation's Committee on "Occupational Hazards in the Operation of Sewage Works"[3] should be followed. In particular a minimum diameter of 2 in. for gas piping should be adopted, and all pipes should be laid on a good foundation, protected from freezing, and pitched to *approved* condensate traps. Do not use home-made traps or any of the so-called automatic types. The gas piping appurtenances (gas meters, pressure regulators, condensate traps, and sometimes the flame traps) should be grouped together in a well ventilated explosion-protected structure such as a digestion tank control gallery or separate room with outside entrance only. All units except flame traps should have by-passes. Figure 4 shows a well planned lay-out.

Waste gas burners should be safely located. Prefabricated digester covers are equipped with pressure and vacuum reliefs. Locally designed and built covers should be likewise equipped. Explosions are still occurring from U-tube water-seal type traps on gas lines. These are not safe and should never be used. Vents from any part of the gas system to atmosphere should never be permitted to terminate within a confined space. Even the atmospheric diaphragm vent on boiler pressure regulating valves should be vented to outdoors. As a word of caution, such diaphragms have been found to crack with age.

Designing engineers have a responsibility to provide *detailed* drawings of gas layouts for the guidance of the artisans, and not depend on the judgment of local workmen in the important matter of making correct gas piping hook-ups.

[The next article in Mr. Van Kleeck's series will discuss the important topic "Operation of Heated Sludge Digesters."—Ed.]

[3] Manual of Practice No. 1, Federation of Sewage Works Associations, 325 Illinois Bldg., Champaign, Ill.

WHITE WATER TREATMENT AND RECOVERY*

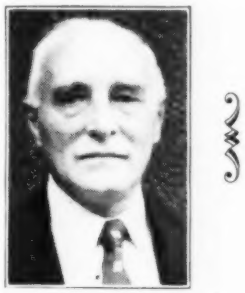
III. Concentration of White Water Sludges; Some Affecting Factors

by

WILLEM RUDOLFS and A. J. PALLADINO

Chief and Research Assistant
RUTGERS UNIVERSITY, NEW BRUNSWICK, N. J.

THE clarification of white water from the manufacture of paper and paperboard results in a voluminous sludge. The volume of sludge may vary with the method of clarification, but handling and disposal remains one of the major problems connected with the treatment of mill wastes. If the watery sludges could be concentrated effectively and economically, either reuse or disposal would be more feasible.



The Senior Author

Nature of Sludges

The nature of white water sludge is affected by the type of raw materials used, the operating procedure, and the capacity and efficiency of save-all equipment, which may be of the wire cylinder, sedimentation or flotation type. The average solids composition of a large number of paperboard white waters is as follows:

	ppm.	% Volatile
Susp. Solids	521	79
Settleable Solids	477	79
Non-Settleable Solids	45	78
Dissolved Solids	1276	41
Total Solids	1797	52

The suspended, dissolved and total solids of white water are about 1.5 times those of strong sewage, but greater settle-ability and higher volatile content of white water suspended solids are indicated. The solids in suspension in white water consist of fibre, filler material and, in the case of paperboard wastes, of considerable quantities of impurities. Rudolfs and Axe[1] found the average suspended solids loss in the white water to be about 4.35 lbs. per 1000 gal., of which about 80 per cent was apparent fibre, i.e., volatile. They found [2] that the sludge volume obtained by plain settling of paperboard white waters averaged 7.7 per cent of the original waste volume, or 30,000 gal. per 100 tons of product.

*Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University, Department of Sanitation. Parts I and II of this series are to be found in *Water & Sewage Works* for June and July, 1948.

Materials, Methods and Experimental Procedures

The white water sludges used in this study were obtained from three paperboard and one tissue mill. The paperboard sludges were coagulated from the mill wastes with alum and activated silica or obtained by settling. Sludges from the tissue mill were obtained by inducing flotation of the fibre particles in the mill waste. This waste represented that portion of the filtrate from the cloudy port of a vacuum filter save-all and consisted mainly of short fibre material.

In the gravity settling tests 300 ml. sludge samples were allowed to stand in 500 ml. graduates, and sludge volume readings were made at staggered intervals.

The characteristics of the sludges utilized in this investigation are shown in Table I. The solids concentration of these sludges varied from 0.45 to 1.8 per cent and the ratio of the suspended solids to total solids varied from 0.76 to 0.96, indicating that only a small percentage of the total solids was in the dissolved state.

The sludge obtained by alum coagulation of the white water differed only slightly from those of the sludges obtained by 2 hours' plain settling. The alum coagulated sludge samples were of slightly higher solids concentration in each case.

Concentration by Gravity Settling

The settling quality of white water sludge can probably best be illus-

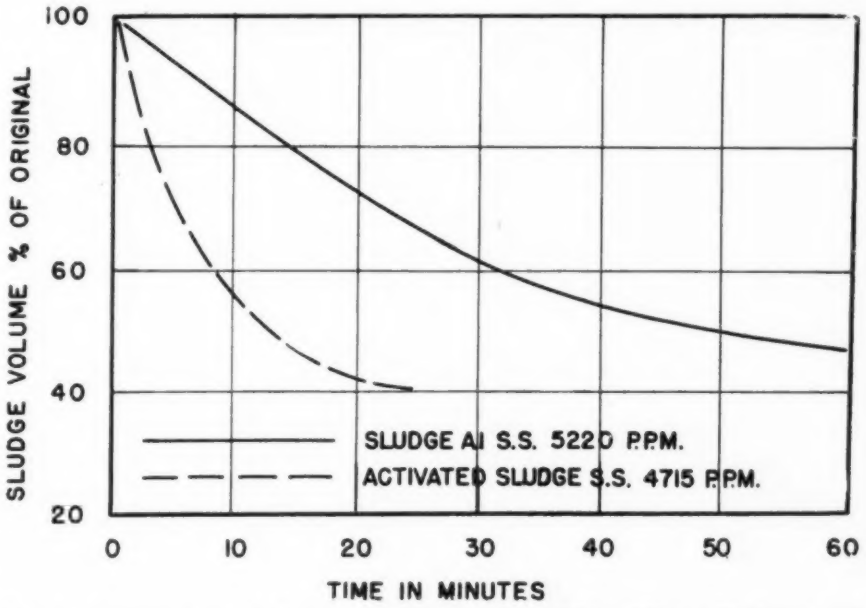


Fig. 1. Comparison of Concentration Rates of White Water Sludges and Activated Sludge.

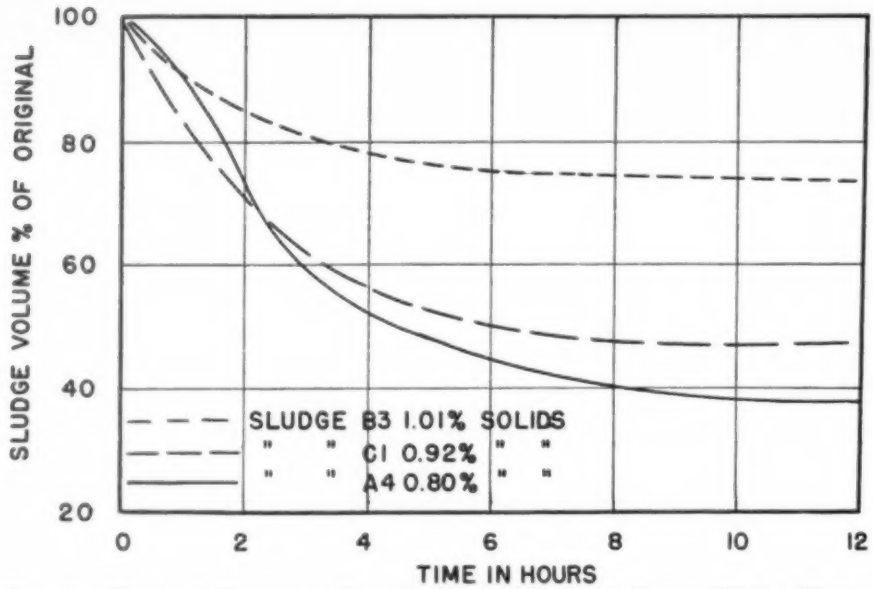


Fig. 2. Effect of Time on Concentration Rates of Some White Water Sludges.

trated by comparing its concentration rate with that of return activated sludge. The latter, of all waste sludges, most closely approximates the suspended solids content and settling characteristics of white water sludge (Fig. 1). The greater colloidal matter content of white water sludge and probably its smaller equivalent particle size account for the differences in the settling rate.

Casual inspection of Fig. 1 shows the very nearly linear nature of the first part of the concentration time curve for white water sludge. According to Deane [3], this constant concentration rate is characteristic of hindered settling. The second phase may be considered as compaction. The zone between the two phases will be termed the "zone of compression."

Of the hydraulic characteristics affecting settling, sidewall area and surface area are probably the most important. Microscopic measurements made of fibre in paperboard sludge indicate the fibre length to range from .045 to 4.5 mm. Since the settling tests were conducted in 500 ml. graduates of diameter 4.70 cm., the fibre lengths ranged from 0.095 to 9.5 per cent of the container diameter.

The surface area effect comes into play by virtue of the fact that, for a given volume of sludge, the surface area is inversely proportional to depth. Since the subsidence rate is nearly constant in the hindered settling phase, a given concentration will be reached in less time when the surface area is large, i.e., when the depth is small. However, subsidence in the compaction phase, which proceeds at a decidedly reduced rate and is due to the squeezing out of entrained liquid, is proportional to sludge depth.

Effect of Surface Area and Sidewall Effect

To illustrate the effect of the surface area factor and to determine the relative effectiveness of this factor versus that of sidewall effect, 250 ml. portions of sludges were allowed to settle quiescently in 250 and 1000 ml. graduates at room temperature. Sidewall effect was evaluated separately using constant depths of sludges in varying graduates to eliminate the factor of depth. Some results showing the differences in sludge volume reductions after 2 hours of settling follow above.

Results obtained on the concentration rates of granular sludge from lime neutralization of oxidized pickle liquor indicate that sidewall effect was practically negligible with such sludge.

Sludge	Total Diff.	Difference due to Sidewall	Difference due to Surf. Area
A1	28	13	15
	31	5	26
A2	5	1	4
A3	40	10	30
	39	26	13
Average	29	11	18

Effect of Time

To determine the effect of compaction time on sludge concentration, sludges were allowed to settle quiescently up to 142 hours. Fig. 2 depicts typical concentration curves up to 12 hours, which indicate that most of the concentration took place in 3-4 hours. The variations in concentration rates were appreciable and indicate that sludge nature may be more important than solids content in determining the concentration rate.

The subsidence rates of two sludge samples from mill A were compared with those of the sludge obtained by 2 hours' settling of the corresponding white water. The results indicate that the 2 hour settled sludge, although of slightly lower concentration had lower subsidence rates than their alum collected counterparts. The difference, however, was slight. In all results the transition from the phase of hindered settling to that of compaction was evident. There was a marked reduction in the velocity of subsidence beyond the phase of hindered settling.

Initial Concentration

Since variation in concentration rate due to initial concentration is obscured when sludges of different sources are compared, an individual 5 gallon sludge sample collected from the sludge return line of the save-all at mill B was selected for this test, and allowed to settle. Six 500 ml. aliquots were siphoned off at various settling times. Each of these aliquots, although of different concentration, was dispersed in the same mother liquor. This process was twice repeated after that portion of

Table I

Sludge Characteristics

	MILL A				MILL B					MILL C		MILL D		
	A1	A2	A3	A4	B1	B2	B3*	B4	B5	C1	D1	D2	D3	
Solids, %	0.60	1.24	0.45	0.80	1.28	1.80	1.00	1.27	0.87	0.92	0.75	0.89	1.4	
Ash, %	27	24	21	25	21	20	21	19	18	31	50	10		
Susp. Solids, %	0.52	1.14	0.34	0.64	1.15	1.66	0.89	1.13	0.75	0.86	0.61	0.85		
Ash, %	24	23	17	25	15	16	13	13	9	28	51	8		
Ratio Susp. Solids to Total Solids	0.87	0.92	0.76	0.80	0.90	0.92	0.89	0.89	0.88	0.94	0.81	0.96		
pH	6.5	5.2	6.9	6.1	5.1	5.5	5.5	6.8	5.0	4.6	5.6	8.3		
Alkalinity, ppm.	100	88	90	220										
Acidity, ppm.	50		25	170										

*Sludge collected without use of coagulants. Alkalinity and acidity as $CaCO_3$

the sample previously removed was returned to restore the 5 gallon sample to its original volume. The initial suspended solids concentration in the aliquots varied from 2500 to 13,500 ppm. Fig. 3 showing the concentration rates for sludges of different initial concentrations, illustrates the general relationship observed for 18 conducted tests. The rate of subsidence in the hindered settling phase was greater and the zone of compression was sharper and was encountered sooner with weaker sludges. The subsidence rate in the compaction phase, however, was greater in the initially more concentrated sludges.

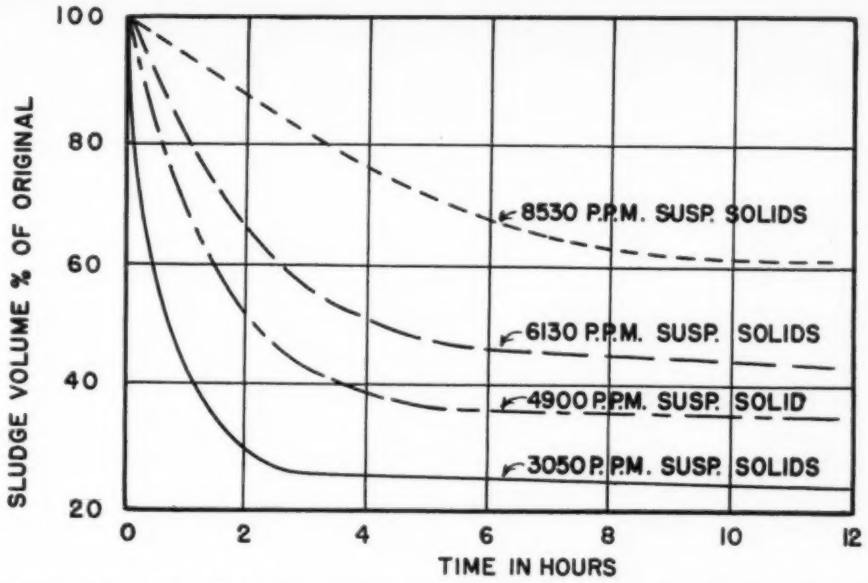


Fig. 3. Effect of Initial Concentration on the Concentration Rates of White Water Sludge.

Effect of Temperature

To determine the effect of temperature, samples of sludges were settled quiescently at temperatures of 10°C, 20°C, 25°C, 37°C, 50°C. A one hour temperature adjustment period was allowed for each sample before the start of the settling test. As an example, the effect of temperature on the subsidence rate is shown in Fig. 4 for sludge A4 in which the subsidence rate is plotted with temperature as a parameter (for clarity, the curves for 20°C and 37°C were omitted from the plot). These curves illustrate that greater subsidence rates were attainable at higher temperatures. A reduction of about 60 per cent in sludge volume was obtained in 4 hours at 55°C, in 8 hours at 20°C and in 12 hours at 10°C.

Effect of Flocculation

Results on sludges flocculated in a stirring apparatus at 24 rpm. for 15, 30 and 60 min. and allowed to settle quiescently indicate that the flocculation process exerts a negligible effect. Similar results were obtained with other sludges.

Effect of Deaeration

Sludge deaerated at room temperature for 10 minutes under a vacuum equivalent to 25 inches of mercury, and then remixed, shows that a greater rate of concentration is attained by deaeration (Fig. 5). To obtain a sludge volume reduction of 57 per cent, deaerated sludge required 2 hours, whereas settled sludge required 6 hours' concentration time. The advantage of deaeration is incorporated in the Marx save-all for recovery of fibre from white water.

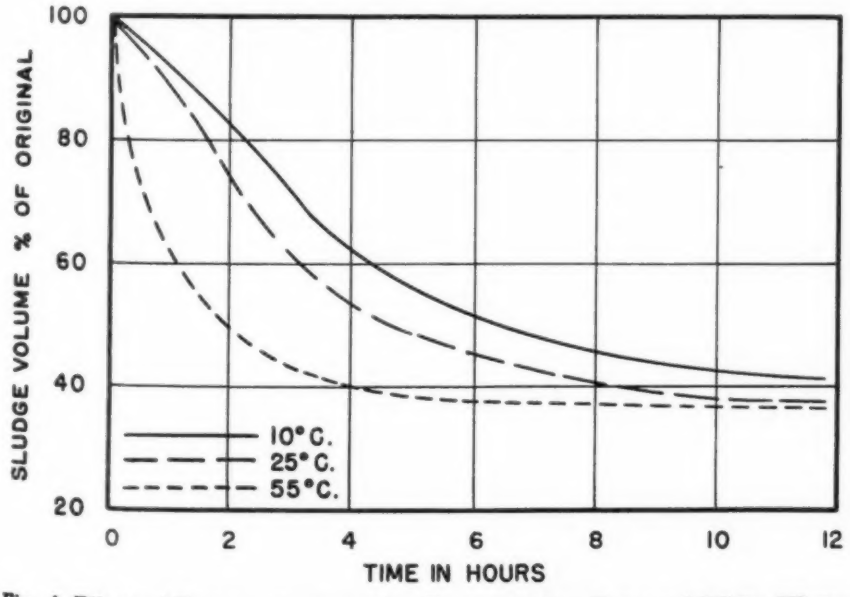


Fig. 4. Effect of Temperature on the Concentration Rates of White Water Sludge.

Discussion of Results

The concentration by gravity settling of white water sludges was variable and was found to depend principally upon the sludge nature and initial concentration. Regardless of these two factors, however, the sludge concentration curves were characterized by a phase of hindered settling in which concentration took place relatively rapidly and a phase of compaction in which concentration took place extremely slowly. Because of this slow rate of compaction of white water sludge, there is little advantage in attempting to concentrate this sludge beyond the zone of compression. In sludge lagoons with long settling periods concentration is eventually accomplished.

The experiments conducted to determine the effect of time on sludge concentration have indicated that the time of achieving the zone of compression and the attendant sludge volume reduction vary with the nature of the sludge. For a sludge of specific nature, however, the zone of compression is reached in less time, is better defined and corresponds to a greater percentage reduction in sludge volume when the sludge is of lower initial concentration. Since the period in which efficient settling is accomplished and the sludge volume reduction accruing is dependent upon the sludge nature and concentration, the effectiveness of gravity settling on a particular sludge can be determined only by settling tests of that sludge.

In such a test, there are two important factors to be considered if experimental results are to be ex-

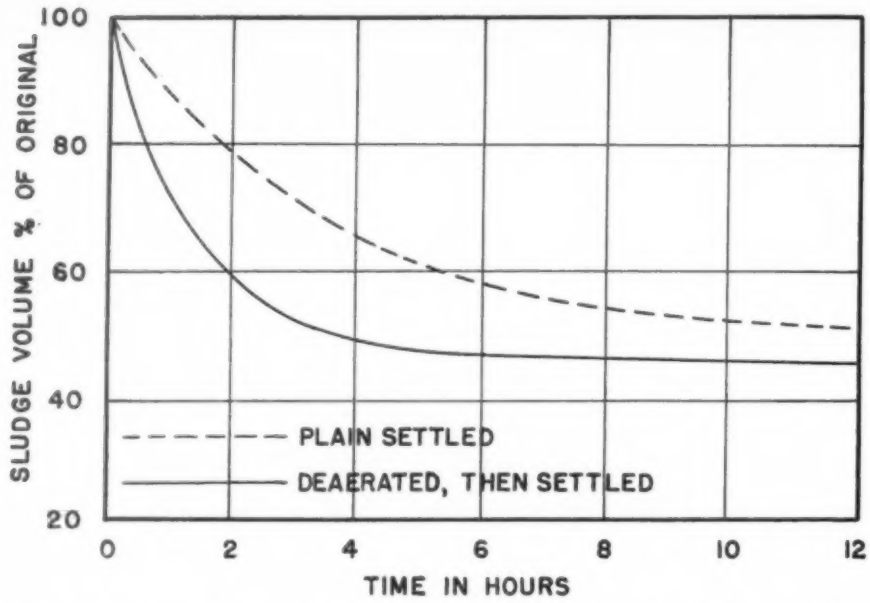


Fig. 5. Effect of Deaeration on the Concentration of White Water Sludge.

tended to actual operating conditions. These are (a) the effect of depth (or surface area when a given sludge volume is considered) and (b) the effect of sidewall friction. Both of these factors were shown under the conditions of the tests to influence the concentration rate of white water sludges.

If the sidewall effect is negligible as in the case of granular sludges of small particle size or in the case of white water sludge settled in large basins, then results obtained experimentally with a small depth of sludge can be applied to any depth that may be encountered in practice. This can be done by noting the subsidence rate in terms of cm. per sec. rather than the concentration rate in terms of per cent sludge volume reduction per unit time. The former is constant, regardless of the depth, whereas the latter varies inversely with the depth. The time of settling before achievement of the point of compression can be computed from: (a) the concentration at which the point of compression occurs, (b) the depth to which the sludge must settle under operating conditions to attain this concentration, and (c) the subsidence rate of the sludge in the hindered settling phase.

Inasmuch as all sludges were tested under the same conditions and were equally affected by sidewall friction, the results serve as a basis for comparison of different sludges and the effectiveness of various treatment measures. Under the conditions of the gravity settling tests, the zones of compression occurred after 2 to 5 hours for sludges of initial concentration, ranging from 0.40 to 0.80 per cent solids and resulted in 50 to 80 per cent sludge volume reduction. Sludges with higher solids concentration, concentrated to a lesser degree and required longer periods to reach the zone of compression. Hindered settling subsidence rates of 0.023 to .026 cm. per sec. were recorded in the case of sludge varying from 2,500 to 3,500 ppm. suspended solids concentration, which compares to .080 to .15 cm. per sec. for activated sludge.

In the hindered settling period initially thinner sludges may actually attain higher concentrations than initially thicker sludges. This phenomenon is probably the result of settling momentum built up during the early periods in the thin sludges. This momentum is eventually spent so that in the compaction phase the initial order of concentration is re-established. Therefore, if sludge is to be concentrated by short period settling only, there may be an advantage in beginning with a thinner sludge. Because of decreased specific gravity and viscosity of the settling medium, greater subsidence rates are attained at higher temperatures. This has definite application to white water sludge, since white water frequently leaves the mill at a temperature between 50-60°C.

The buoyant effect of gases coming out of solution because of temperature increases or supersaturation of the gases of decomposition may impede settling. It is impractical to remove these gases by application of a vacuum; however, it may be possible to remove them by means such as that employed in the Marx save-all.

Summary

The possible effect of certain sludge characteristics, time of settling, initial concentration of sludge, temperature, flocculation and deaeration of sludge, and the effect of surface area and sidewalls, on the thickening of paper mill white water were studied. It was found that: (1) In general, white water sludge will concentrate at relatively low rates; the effectiveness of gravity settling depends principally on the sludge nature and initial concentration; (2) Subsidence in the hindered settling phase is more rapid with sludges of lower initial concentration, than with sludges of initially higher concentration, indicating the value of frequent sludge removal; (3) Greater subsidence velocities are achieved at higher sludge temperatures, and in order to preserve high sludge temperatures, frequent sludge removals are preferable in cases where the white water is treated by sedimentation; (4) The buoyant effect of gases evolving impedes settling through attachment of gas bubbles to sludge particles; and (5) The volume of sludge can be readily decreased in 3-6 hours to 25-40 per cent of the original by gravity settling or flotation, depending upon the initial concentration; further compaction is primarily a function of time and temperature.

References

1. Rudolfs, W., and Axe, E. J. Variations and Similarities of Paperboard Mill White Water, *Paper Trade Journal*, 125, 53-58, 1947.

2. Rudolfs, W., and Axe, E. J., Concentration of White Water Sludges, *Paper Trade Journal* (in press).

3. Deane, W. A., Settling Problems, *Proc. Amer. Electro-chemical Soc.*—April, 659, 688, 1920.

MY LUDWIG NEVER COULD UNDERSTAND WHY I'D BEEF ABOUT HOT WEATHER—HIM WHAT WORKED IN A NICE COOL SEWER ALL DAY
Mostly Malarky by Walt
MAIZIE & DAISY
WAIKN ONE'S MAIZIE

Oh! For a Nice Cool Sewer.

HANDLING CHLORINE SAFELY

by
J. O. LOGAN
The Mathieson Alkali Works
NEW YORK, N.Y.

THE fact that chlorine actively attacks organic materials makes it valuable as a germicide. This same property makes it highly irritating to human tissue; that is, it attacks and inflames the skin and the mucous membranes of the eyes, nose and throat and, on severe exposure, may destroy these tissues. Liquid chlorine applied to the skin causes serious burns. It is dangerous to breathe concentrations of 40 to 60 parts of the gas per million parts of air for periods of 30 to 60 minutes, and concentrations of 1,000 parts per million are rapidly fatal.

Fortunately, relatively small amounts of chlorine can be readily detected by its characteristic odor and irritating effect, before dangerous concentrations are reached. Thus 3.5 ppm. of chlorine is detectable by odor and 15.1 ppm. causes irritation of the throat. Chlorine produces no cumulative effects and complete recovery from mild exposure is characteristic.

Though the gas is about 2½ times heavier than air and tends to flow downward when released into the atmosphere, moderate air currents may distribute it over a wide area. Thus a single leaky cylinder in a well populated locality could seriously affect a great number of people.

Chlorine is, therefore, a chemical that should be treated with profound respect. But, as proved by years of experience at water works all over the country, chlorine can be handled with complete safety if certain precautions are taken.

These precautions fall naturally into two divisions: those that are to be observed in handling chlorine under normal circumstances and those that apply when emergencies arise. But first it may be well to review the physical details of the cylinders in which chlorine is shipped.

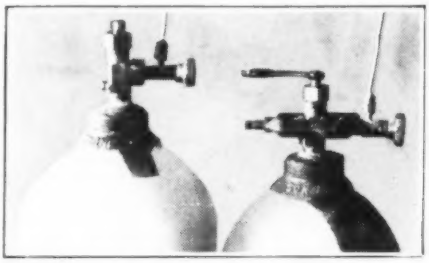
Details of Chlorine Cylinders

These cylinders are of seamless steel construction and are supplied in three standard sizes, having capacities of 100, 105 and 150 pounds respectively. The gross weights range from 170 to 257 pounds. In accordance with Interstate Commerce Commission regulations, each cylinder is filled with liquid chlorine to not more than 125 per cent of its water capacity by weight. The remaining space acts as an expansion chamber and is filled with chlorine gas.

The pressure within a cylinder containing any quantity of liquid chlorine depends upon the temperature, and not upon the amount of chlorine in the cylinder. As it is important to know how temperature affects internal pressure, the following table, in degrees Fahrenheit and pounds per square inch, should be memorized by everyone handling chlorine:

Temperature °F	Pressure
Minus 30 deg.	zero
32 deg.	39 lb.
68 deg.	82 lb.
104 deg.	150 lb.
157 deg.	350 lb.

Each cylinder is equipped with an approved type of cylinder valve. Special packing is used and is held in place by a nut through which the valve stem passes. The valve stem is turned by means of a special wrench provided for the purpose. Valve stem, packing nut, and outlet cap all tighten clockwise.



Close-up of Connections to Chlorine Cylinders.

That on the left is made by means of a union while that on the right is made by means of a connector and cylinder clamp. Note the auxiliary valves and wrench of proper size.

A special feature of the chlorine cylinder valve assembly is the fusible metal plug, which acts as a safety device. Since high temperatures build up excessive pressures which may put dangerous strain on the cylinder, it is necessary to provide some automatic release. This is the purpose of the safety plug, which melts at 158-165 degrees Fahrenheit, and allows the contents of the cylinder to discharge.

A protective cap is provided to cover the valve except when the cylinder is being emptied.

Handling Cylinders in Service

Chlorine cylinders should be handled carefully and should never be dropped or allowed to strike against each other. They are best moved about on hand trucks, with a clamp support at least two-thirds of the way up the cylinder.

Hoisting of chlorine cylinders should be avoided wherever possible. Where hoisting is necessary, safety lifting clamps may be used, but never a lifting magnet or sling. Never hoist cylinders by the cap.

In connecting a cylinder to the discharge piping, stand it upright, in which position gaseous chlorine will be discharged.

Connection between discharge piping and the cylinder is best made by means of flexible tubing equipped with a male fitting. This is connected to the cylinder valve by means of a yoke. The lead gaskets found under the valve outlet cap are used to make a tight connection. In tightening the yoke, make sure the lead gaskets are not deformed to such an extent as to seal the valve outlet.

If a union is used to connect the discharge pipe to the cylinder, make sure that it is specially designed for this service. The threads on the valve outlet are not standard tapered threads and the wrong type of connector must not be forced to fit.

The piping that carries dry chlorine may be of iron, brass or copper. If the cylinder rests upon a platform scale, as is usual practice, the connection between it and the fixed piping should be looped, so as to make it flexible enough to permit accurate weighing.

If a lubricant is needed at any point in the chlorine line, use graphite. Ordinary lubricants are attacked by chlorine, forming gummy substances that tend to block passages. To remove such gum, use carbon tetrachloride, which is not affected by chlorine.

In soldering connections in the chlorine line, use pure lead or silver solder, the latter being preferred. Ordinary 50-50 lead-tin solder is quickly destroyed by chlorine.

Cylinder valves should be opened slowly and only the special valve wrench should be used for the pur-

Chlorine Cylinders on Scale and Connected to Chlorinating Equipment.

Note that cylinder caps are placed on scale for accurate weighing.

pose. One complete turn of the valve stem in a counterclockwise direction opens the valve sufficiently to permit discharge. Improper handling of the valve may strip its threads.

If gaseous chlorine is being discharged, keep the cylinder and the discharge piping at the same temperature. If the cylinder should become hotter, because it is exposed to sunlight or for any other reason, the cooler discharge pipe may act as a condenser, causing liquid chlorine to form, which will result in trouble.

Heat should never be applied directly to the cylinder. It is best to discharge the cylinder in a room which has a temperature of about 70 degrees Fahrenheit. If the cylinder is very cold and must be rapidly heated for emergency use, drench it with water at room temperature from a hose. If the rate of gas evolution from the cylinder is not sufficient, consult your chlorine or chlorine equipment supplier for detailed information.

In stopping the flow of chlorine, first close the cylinder valve and, when the pressure gauge in the chlorine line drops to zero, close the valve at the far end of the line. If the cylinder is empty, detach the flexible connection and replace the cylinder outlet cap.

At ordinary temperatures, dry chlorine does not corrode steel or other common metals. In the presence of moisture, however, it is highly corrosive. The chlorine equipment must therefore be kept free from moisture, and lines and valves should be kept tightly closed when not in use to prevent reaction with the moisture of the air. The open end of the line leading from the cylinder should be plugged or capped as soon as the cylinder is disconnected.

Storage of Chlorine Cylinders

Cylinders should be stored standing upright and, preferably, in a cool, dry place. Under no circumstances should they be placed near a source of high heat, such as a radiator, heater, hot air outlet, etc., or near highly flammable substances, such as oil, gasoline, or waste.

If storage is in a separate room, which is advisable, then the room should be equipped with an exhaust fan. Since chlorine is heavier than air and will sink to the floor, the intake to the fan should be located near the floor. Cylinders may be stored out of doors if necessary, but they should be protected from dampness and the weather. Exposure to low temperatures will reduce the internal pressure and the discharge will then be sluggish. In such cases, the cylinders should be moved into a warm room for at least 24 hours before use.

Valve protection hoods and outlet caps should not be removed until the cylinder is ready for use.

Empty cylinders should be tagged or marked with chalk and stored where they will not be mistaken for full cylinders. Cylinders should be returned promptly to the supplier.

In the event of fire in the cylinder storage area, the firemen responding to the alarm should be warned of the presence of chlorine and shown the location of the cylinders.

Precautions Against Emergencies

Chlorine leaks are commonly detected by the odor of the gas. As soon as it is noticed, trained men must put on gas masks and locate the leak, while everyone else in the affected area must leave and stay away until safe conditions have been restored.

Suitable gas masks must, therefore, always be available wherever chlorine is being used. To be available, gas masks must be stored in plain view and where access to them will never be cut off by the gas. They should be kept near but not immediately adjacent to the area in which chlorine cylinders and equipment are stored. If chlorine is used and stored in a confined area, such as a small room, gas masks should be kept outside the area, near its entrance.

The gas masks provided must be of types approved for use in the presence of chlorine by the U. S. Bureau of Mines.* Three kinds are available: canister masks, oxygen breathing apparatus and hose masks.

The canister mask is suitable for handling minor leaks in well-ventilated spaces. It consists essentially of a face piece connected by a corrugated hose to a canister containing a chemical that absorbs chlorine. When the mask is put on, the wearer inhales air drawn through the canister and is thus protected from low cencentrations of the gas.

But where the concentration of the gas is high, as may be the case when a serious leak develops in a poorly ventilated room, the canister mask is unsuitable. One per cent of chlorine in the air will cause the absorbent to heat up and exhaust rapidly. In addition, if the oxygen content of the inhaled air is less than 16 per cent, a canister-mask wearer may suffocate. Under these conditions, either the hose type mask or the oxygen breathing apparatus is required.

In the hose type of mask, fresh air is supplied through a hose from a point outside the contaminated area, while the oxygen breathing apparatus is self-contained. Both provide respiratory protection. In addition, gloves and other chlorine-resistant protective clothing must be worn to prevent injury to the skin.

A temporary measure of protection may be afforded by placing over the

*Gas masks approved for use in the presence of chlorine are manufactured by the Davis Emergency Equipment Co., Inc., Newark, New Jersey, the Mine Safety Appliances Co., Pittsburgh, Pennsylvania, and W. S. Wilson Corp., New York, New York.

Courtesy, Davis Emergency Equipment Company

A Canister Respirator to Remove Chlorine from Air as It Is Inhaled.

This respirator cannot be used where there is a deficiency of oxygen, or where the chlorine concentration of the air is high.

mouth and nostrils a cloth saturated with water or, if available, sodium thiosulphate ("hypo") solution. *It should be understood however that this method is an emergency measure only and will give merely partial and temporary protection.*

As only trained people can use gas masks properly, gas mask drills, in which all employees participate, should be held regularly at every chlorination station.

Care of Gas Masks

At regular intervals of four months or less, gas masks should be inspected. The presence of leaks in the face-piece of a canister mask can readily be detected by putting the mask on, pinching the corrugated tube, and taking a deep breath. The tube can be checked similarly by holding the hand firmly over the bottom of the canister and inhaling. In each case the face-piece will collapse if the mask is in good condition. If leaks are found that cannot be corrected by tightening the straps or bolts, new parts should be purchased.

The power of a chemical canister to absorb chlorine is limited and a record of the use of each canister should therefore be kept. After two hours of use in mild chlorine concentrations, or fifteen to twenty minutes in higher concentrations, the contents of a canister are exhausted and the canister should be replaced.

The method of inspecting and testing the other types of masks will vary somewhat for different types. Inspections should be regular and frequent and should follow the procedures suggested by the manufacturer of the equipment.

Handling Leaking Cylinders

Let us now consider methods of dealing with leaking cylinders, with the understanding that, whenever exposure to chlorine is involved, the work is always to be done by men wearing gas masks.

To begin with, in approaching a chlorine leak, with or without respiratory protection, bear in mind that chlorine is heavier than air and will tend to accumlate at the lowest point on the premises. Therefore, keep the head high, stay to the windward, and avoid deep breathing. Also, protect the hands with gloves and the body with an apron of chlorine-resistant material.

Furthermore, never depend on the nose to locate a chlorine leak; such action may have serious, and even fatal, consequences. The easy way is to hold an open bottle of ammonia water, or a rag soaked in this solution, near suspected places, as a white cloud of ammonium chloride will be formed wherever chlorine is escaping.

Always attend to chlorine leaks immediately, because they tend to grow larger and allow the gas to spread over wide areas.

Water should not be sprayed on a chlorine leak because it will cause corrosion and make the leak worse.

When a cylinder is stored for a considerable period of time, the valve packing may dry out and permit leakage around the valve stem when the valve is opened. In this event, close the valve and tighten the packing nut. If this does not stop the leak, close the valve, remove the packing nut, and replace the old packing with new material, which can be obtained from the chlorine supplier. Ordinary packing must not be used for this purpose.

Courtesy, Mine Safety Appliances Company

This White Canister Contains a Material Which Provides Specific Protection Against Chlorine.

It should be replaced regularly, or as soon as signs of chlorine leakage are noticeable.

Sometimes, after repeated use, the cylinder valve may not seat properly, and escaping chlorine will be noticed when the outlet cap is removed. This condition is best remedied by attaching to the outlet an auxiliary valve, which can be obtained from the supplier. When the cylinder is emptied, the auxiliary valve can be removed, as the gasketed outlet cap will seal in any residual gas.

The valve stem threads may be stripped if the stem is turned too vigorously, as by the careless use of a large wrench. If this happens after the cylinder has been connected to the discharge piping, the valve may be opened widely enough, by turning and pulling the valve stem with pliers, to permit the gas to be discharged in the normal manner. The valve may be partly closed by tapping down the stem with a hammer but, as this may not produce complete closure, the cylinder should not be disconnected until it is empty.

When a cylinder has been exposed to excessive heat, the fusible safety plug may leak or even blow out. To stop the leak, clamp a piece of sheet lead over the opening by means of a C-clamp. A cylinder thus treated has, however, lost its safety valve and must be discharged at once, either in service or in some other safe way.

Once in a while, chlorine cylinders develop leaks that cannot be stopped, as when a valve assembly is cracked or broken off or a hole is eaten into the body of a cylinder by corrosion. In such cases, three things must be done:

1. Reduce the flow of chlorine to a minimum to decrease the danger.
2. Remove the cylinder to a place where the gas will injure no one.
3. Discharge its contents safely.

To minimize the flow, place the cylinder so that gas, and not liquid, will escape. This will not only reduce the volume of the discharge, but, since the escaping gas will cool the cylinder, the internal pressure will drop and the gas discharge will diminish. Covering the cylinder with insulating material will further reduce the flow by lowering the temperature of the liquid chlorine.

Leaks through small openings, such as cracks, may often be checked to some extent by covering the opening with adhesive tape.

Sometimes a pin-hole leak in a cylinder may be temporarily stopped by driving a tapered hardwood peg or metal drift pin in the hole. Care must be taken in driving in the plug, because the cylinder wall in the area of the hole may be thin and may crumble, making the leak worse. Since no ordinary materials will withstand the action of chlorine for long, the contents of mended cylinders should be discharged promptly.

When the leakage is cut down as much as possible, the next step is to carry the cylinder to a place where the gas will not endanger anyone. The site should be selected with due regard to the direction of the wind and the slope of the ground and should be close to a reservoir, or other large body of water, if possible.

Chlorine Container Size—Pounds Net	Caustic Soda Pounds 100%	Caustic Soda Water Gals.	Soda Ash Pounds	Soda Ash Water Gals.	*Hydrated Lime Pounds	*Hydrated Lime Water Gals.
100	125	40	300	100	125	125
150	188	60	450	150	188	188

*Hydrated lime should not be confused with agricultural lime; the latter is merely ground limestone and cannot be used to absorb chlorine.

Then if this procedure is practicable, discharge the chlorine into the water. This should be done by attaching a long piece of ordinary rubber hose to the cylinder outlet, throwing the weighted end of the hose into deep water, and opening the cylinder valve wide.

Because of the cooling action of the evaporating gas, ice will form on the cylinder and the pressure will fall to so low a point that several days may be required for emptying the cylinder. To expedite this operation, drench the cylinder frequently with water. This will keep the temperature and pressure high enough to empty the cylinder in about eight hours.

When the chlorine cannot be discharged into a large body of water, it may be absorbed in an alkaline solution. Caustic soda, soda ash or hydrated lime may be used for this purpose. Suitable proportions of alkali are shown in the table above.

The chlorine may be passed into the solution through an iron pipe or rubber hose, weighted to keep the outlet below the surface of the solution.

Sometimes it is impossible to place a leaking cylinder where it will not endanger lives. In this case, throw the cylinder into a reservoir, or other body of water, after tying a line to it so that the empty cylinder, which may float, can be retrieved.

When a leak occurs in the piping that carries the chlorine from the cylinder, the cylinder valve should be shut off and the defect repaired.

Occasionally, suppliers get complaints about cylinders that are found to be in good operating condition, when examined. Under these circumstances, the trouble was probably due to either improper handling of the cylinder or the use of defective equipment.

In general, whenever a cylinder is found defective for any reason, the supplier should be immediately notified and informed of the identifying number stamped on the cylinder. He will promptly furnish advice as to the handling and disposition of the cylinder, if this is necessary, and, in any case, will want to make a thorough investigation of the matter.

Curved Back Hand Truck Designed for Safe Handling of Chlorine Cylinders.

Prophylactic and First Aid Measures*

Prophylactic Measures: The following prophylactic measures are recommended for persons who may be exposed to chlorine.

*As officially adopted by the Chlorine Institute.

Prophylaxis, 1. Provide physical examinations including chest X-ray of applicants and of employees handling chlorine.

Prophylaxis, 2. Provide instructions and approved gas masks for all employees handling chlorine.

First Aid Measures: The following first aid measures are recommended for persons exposed to chlorine:

First Aid, 1. Carry patient from gas area. Patient should preferably be kept in a warm room (about 70 degrees Fahrenheit). Supply blankets if necessary. Keep patient warm and quiet. Rest is essential.

First Aid, 2. Place patient on back with head and back elevated.

First Aid, 3. CALL A PHYSICIAN IMMEDIATELY.

First Aid, 4. Splashes of liquid chlorine and chlorinated water destroy clothing, and if such clothing is next to the skin will provide irritation and acid burns. In such cases remove clothes and keep patient warm with blankets.

First Aid, 5. Carbon dioxide and oxygen mixture with not to exceed 7 per cent of carbon dioxide may be given. This mixture, ready prepared, and sold with the necessary apparatus, can be administered intermittently for periods of two minutes followed by two-minute rest periods over a total period not to exceed thirty minutes. Instructions of the purveyor of the gas apparatus should be carefully obeyed. If carbon dioxide and oxygen mixture is not readily available, oxygen alone may be used.

First Aid, 6. Milk may be given in mild cases as a relief from throat irritation.

First Aid, 7. If breathing has apparently ceased, start immediately the artificial prone pressure method of resuscitation (Schafer). Do not exceed 18 movements per minute.

First Aid, 8. Provide First Aid as may have been prescribed for emergencies by your company physician pending his arrival.

Philadelphia's Sewage Projects Proceeding

Philadelphia has begun construction of major sewage works installations in the Southwest and Southeast divisions of the City, in the furtherance of its program to clean up the streams in that area. The Northeast sewage treatment works is already well under way in its construction. A major project in the Southeast division is the construction of a portion of the lower Delaware low level intercepting sewer, with the contracts totalling approximately $2,650,000.

The project involves the construction of about 2,400 feet of concrete sewer 11 feet in diameter in deep tunnel. Also included are approximately 4,100 feet of concrete sewer 10 and one half feet in diameter in deep tunnel. The intercepting sewer will be a major link for the Southeast division of the city and will serve as a main collector for the future Southeast sewage treatment works which is now being designed.

Georgia Tech Changes Name

And Now Mr. Freshman, It's GIT

The faculty and administration of Georgia School of Technology has announced that effective July 1, 1948, the name of the school has been changed to Georgia Institute of Technology.

We presume now that upper classmen will no longer say "SCRAM" to a too fresh freshman, but instead will employ the more circumspect "GIT."

U.S.P.H.S. RESEARCH GRANT AND FELLOWSHIP SYMPOSIUM

A UNIQUE meeting was held in the Engineering Society Building at Cincinnati, Ohio, on June 14th and 15th—unique because it brought together for the first time all of the persons who are engaged in research on water and sewage problems under the Research Grant and Fellowship funds of the National Institute of Health and unique also because of the number of interested outsiders who also were invited to and did attend.

The theme of the meeting was research progress in water, sewage, and industrial waste. The symposium was held under the auspices of the Sanitation Study Section of the Division of Research Grants and Fellowships of the National Institute of Health; the Water and Sanitation Investigation Station of the U.S. Public Health Service; and the Cincinnati Section of the Am. Soc. of Civil Engineers.

Thos. R. Camp
Cons. Engr.
Boston, Mass.
(Presided)

W. L. Mallmann
Prof. Bact.
Mich. St. Coll.
Lansing, Mich.

Clair N. Sawyer
Prof. San. Chem.
Mass. Inst. Tech.
Cambridge, Mass.

H. Heukelekian
Prof. San. Biol.
Rutgers Univ.
New Brunswick, N.J.

C. C. Ruchhoft
Prin. Chem.
W. & S. I. Stat.
U.S.P.H.S.
Cincinnati

More than 150 persons attended the meeting and the tremendous interest in these various problems was evidenced by the fact that following the continual session from mid-morning through late afternoon the audience almost to a man remained until nearly 7 o'clock discussing the various papers. Presiding at the session was THOMAS R. CAMP, Cons. Engr., Boston, Mass. Mr. Camp is a member of the study section of the Division of Research Grants and Fellowships. Opening remarks at the meeting were made by V. G. McKenzie, Officer in Charge of the Public Health Service.

Following the opening remarks, HENRY L. ROAHRIG, Executive Secretary, Sanitation Study Section, gave a review of the Research Grants & Fellowship program. Mr. Roahrig explained how the grants had been made and the amount of money which had been appropriated for that purpose. One of the largest grants is some $33,000 to the Federation of Sewage Works Associations which has apportioned its money to six different laboratories where sewage research studies are being carried on. It is not known at the present time just what the appropriation for the ensuing year will be, but it is expected to be as large as in the past year so that all of these studies will continue.

The papers presented at this meeting were in many instances progress reports but all of them dealt with fundamental research in various problems of water, sewage, and industrial waste treatment. Unfortunately these papers cannot be reported in full at this time but it is evident that the research presented by these progress reports will eventually develop into practical application of considerable interest to the field of sanitary engineering.

Algae Control

Prof. Theodore A. Olson, Dept. of Biology, Univ. of Minn., spoke on the history of "TOXIC PLANKTON-BLOOMS AND ASSOCIATED PHENOMENA." Prof. Olson has made a study, both historical and in the field, of the "blooms" or lush growth of algae in small lakes, particularly where these heavy growths have been determined to be toxic to animals. Prof. Olson mentioned Anabaena & Microcystis and the Dynaflagellates associated with the blood red tidal waves in the ocean last year. Among the questions being studied is the possibility that these growths or their soluble by-products may cause gastroenteritis.

Also speaking on this subject of the control of algae was Prof. J.K.G. Silvey of North Texas State College. Prof. Silvey's presentation was a colored movie, taken through a microscope, of various types of algae and other plankton in the process of growth and reproduction. This film is one of the most unusual that it has been this reporter's privilege to observe and it is understood that it might be available if requests are made to Prof. Silvey. Among the interesting facts which Silvey mentions was that in his laboratory, algae had been cultured on sawdust agar.

Prof. W. L. Mallmann, Dept. of Bact., Michigan State College, discussed "BACTERIAL INDICES OF POLLUTION IN LAKE WATERS." In making a study of a lake bathing beach which lies between the outlets of one polluted stream and one unpolluted stream, Prof. Mallmann made tests for Coliform bacteria using both lactose broth and lauryl tryptose sulfate broth as well as the Eijkman test. Prof. Mallmann also made tests for Streptococcus fecalis. He concluded that lauryl tryptose sulfate broth gave better results for Coliform bacteria particularly for the slow growers. The Streptococcus organism appeared to be more resistant than Coliform under some conditions and Prof. Mallmann believes that further studies are necessary to develop a better test for contamination. He points out that the Eijkman test is not specific for Coliform bacteria.

In discussing the "RAPID DETERMINATION OF COPPER IN WATER" Philip W. West of Louisiana State University, explained that he had used Dithiooxamide as a reagent and had found that malonic acid was effective in sequestering interference.

Industrial Waste

Dr. Clair N. Sawyer, Associate Professor of Sanitary Engineering, Mass. Institute of Tech., Cambridge, Mass., presented data collected by himself, Earl J. Anderson, and Leon

Wineburger on "NITROGEN REQUIREMENTS IN THE BIOLOGICAL STABILIZATION OF INDUSTRIAL WASTES." These data emphasized the fact that in the determination of B.O.D., nitrogen must be supplied to the organism. Where proteins are present the nitrogen supply may come from the protein, otherwise some nitrogen bearing compound must be added in order that the biological stabilization will proceed properly. Phosphorus requirements were likewise studied and found to be definite although considerable less than in the case of nitrogen. Generally speaking it may be said that for ordinary carbohydrate oxidation, one part per million of nitrogen is required for each 18.5 parts per million of B.O.D. In the case of phosphorus it is approximately one part of phosphorus to 80 parts of B.O.D.

A. M. Buswell
Chief, Ill. State Water Survey
Urbana, Ill.

Carl Schwob
Prin. Engr.
U.S.P.H.S.
Washington, D.C.

Speaking of "ANAEROBIC DIGESTION AND TOXICITY OF INDUSTRIAL WASTES," Dr. H. Heukelekian, Rutgers University, discussed the liquefaction and gasification stages of digestion pointing to the production of volatile acids as intermediates in the digestion process. In order to determine the volatile acids Dr. Heukelekian believes that the volatile acid test needs considerable improvement.

When it comes to determination of toxicity of industrial wastes Dr. Heukelekian says that dilution method for the B.O.D. determination is no good. He prefers the use of the Sierp direct oxidation method, using all glass apparatus. This latter method however, is inapplicable below 35 parts per million of B.O.D. Below that value it is suggested that the Warburg manometric method be used. Toxicity is determined by adding the industrial waste to activated sludge or some other substrate, and determining the oxidation rate.

"VELOCITY CONSTANT STUDIES OF THE B.O.D. REACTION IN SEWAGE DILUTIONS" was the subject of a paper by C. C. Ruchhoft of the Water & Sanitation Investigation Station of the U.S. Public Health Service, Cincinnati. Mr. Ruchhoft pointed out that from a study of more than 50 sewage samples, it was shown that a considerable variation was obtained in **k** values for the oxidation formula. This variation in **k** was unpredictable and independent of the origin of the sewage. The data obtained indicated that the value of **k** in a series of B.O.D. observations was dependent to a large extent upon the period of observations selected for a study and to a lesser extent upon the sewage concentration. The **k** and **l** values obtained for a short period of observation have little extrapolative value and cannot be used to estimate demands for extended periods.

"The results of these studies contradict the conception that there is a uniform velocity constant for sewage dilutions, even at a constant temperature, and they also indicate that nitrogenous oxidation is commonly initiated over a very considerable period of time during the incubation, and the general theory of clear-cut carbonaceous and nitrogenous stages is untenable."

W. D. Hatfield
Supt., San. Dist.
Decatur, Ill.

D. E. Bloodgood
Prof. San. Engr.
Purdue Univ.

Factors which affect the variation in **k** values include temperature, pH, complexity and concentration of the microflora and fauna, composition and concentration of organic matter in the substrate, the presence of necessary accessory nutrients, and of toxic ions or compounds, and the supply of oxgyen. Either the manometric or oxygen utilometer method, or the excess oxygen dilution method may be used for studying sewage. "The dilution method is the most useful for the majority of wastes, but the application of blank seed sample demands, as correction factors, is an erroneous procedure and should be avoided" according to Mr. Ruchhoft.

While these tests do not belittle the importance of the B.O.D. determination they do show that it is necessary to make the determination with care in order that the results be of value.

Prof. Robert S. Ingols, Georgia School of Technology, Atlanta, Ga., spoke on "INDICES OF SEWAGE STRENGTH," with particular reference to the determination of oxygen consumed values by the acid di-chromate method as against the B.O.D. values obtained by the dilution method. Mr. Ingols is also studying the methylene blue test and determining the color changes electrophoto-metrically.

Chlorination

C. H. Connell, Associate Prof. of Sanitary Chemistry, reported on work done by himself, Wallace M. Norton, Jr., and Ivy Lee Jones, from the Dept. of Preventive Medicine and Public Health, University of Texas Medical Branch. Prof. Connell reported on experimental data on rate and extent of formation of chloramines from chlorination in a pure water-ammonia system with the ammonia nitrogen level at 20 ppm. Studies were made at two different temperature ranges, 2°-4° and 22°-24°C., at five different pH ranges, and seven different chlorine dosage ranges, with chlorine contact time ranging from 3 seconds to 96 hours. As the chlorine dosage is increased Prof. Connell's data indicated that not all of the chlorine could be accounted for, but no indication was given as to where that relatively large portion of the chlorine disappeared to.

In reporting on "STUDY OF THE DICHROMATE REFLUX METHOD" for the determination of chemical oxygen demand W. Allan Moore, together with Robert T. Kroner and C. C. Ruchhoft of the Water & Sanitation Investigation Station of the U.S.P.H.S. in Cincinnati, stated that the extent to which an organic compound was oxidized by this material depended upon the chemical structure of the material, although no definite relation was determined. The effect of chlorides on the method was determined and found to be appreciable in the high ranges. In reply to a question Mr. Moore stated that he believed that this method was capable of development into a technic which should replace the present permanganate method for oxygen consumed in "Standard Methods for the Examination of Water and Sewage."

F. W. Gilcreas
N.Y. State Dept. of Hlth. Labs.
Albany, N.Y.

R. S. Ingols
Res. Assoc. Prof.
Ga. School Tech.
Atlanta, Ga.

M. B. Ettinger and C. C. Ruchhoft of the Water & Sanitation Invest. Sta. reported on "A STUDY OF THE DETERMINATION OF PHENOL AND STRUCTURALLY RELATED COMPOUNDS BY THE GIBBS METHOD." Several factors have been found to affect the amount and characteristics of the color formed in this test. The authors have developed a technic which they believe is useful in the method for accurate determination of phenol, and rapid methods for early detection of trace quantities of phenol. The test still has its difficulties but as the technic is developed by these investigators it appears that one of the weakest tests in the "*Standard Methods for the Examination of Water & Sewage*" can be replaced with an improved technic.

"THE DETERMINATION OF CYANIDES IN POLLUTED WATERS" was reported on by F. M. Middleton, of the Water & Sanitation Invest. Station of the Public Health Service of Cincinnati. Four different methods were studied, most of which were subjected to improved technic but the author concluded that "no single method for determining cyanide in polluted water can be prescribed. Selection of the method must be based on the type of sample concentration form of cyanide contents, sensitivity desired, and interfering materials."

While a previous paper by Dr. Sawyer was a report on the nitrogen requirements for the oxidation of organic matter by the biological processes involved in the B.O.D. test, Prof. A. M. Buswell of the Illinois State Water Survey, Urbana, Illinois, reported on "THE NITRIFICATION PHASE OF THE B.O.D. TEST," pointing out that the bacteria could utilize the oxidation of nitrogen to obtain energy. These studies are still in the preliminary stage.

Determination of Grease

"THE DETERMINATION OF GREASE IN SEWAGE" is under investigation at the State Department of Health, Albany, New York, under the direction of F. W. Gilcreas. Mr. Gilcreas reported that the tests to date had indicated weaknesses in all of the proposed methods now existing. It is the intention of the research project to develop a grease method that will determine "the most grease in the least time, with least interference and the least equipment necessary." At present the combined extraction procedure using chloroform first, followed by petroleum ether is giving the best results. The wet extraction method is under investigation but emulsions formed make its application doubtful. Some suggestions were given for breaking the emulsion.

Prof. Don E. Bloodgood, Purdue University, Lafayette, Indiana, reported on "RESEARCH ON CYANIDE AND OTHER TOXIC WASTE TREATMENT." The treatment consisted of using a cation exchanger for the removal of chromium. The exchanger will remove most of the trivalent chromium from the liquor and all of that which is removed by the exchanged material can be recovered. Cyanide wastes were likewise treated through a cation exchanger which converts the metal cyanide to hydrocyanic acid which can be aerated out of solution.

"SEPTIC TANK STUDIES" was the subject of the paper presented by S. R. Weibel, of the Water & Sanitation Investigation Station, Cincinnati, Ohio, Mr. Weibel pointed out that some 17 million persons in this country depend on individual household septic tank soil absorption systems. The use of septic tanks is being actively studied in Cincinnati, and there are now 16 various sizes of types and designs of tanks operating in the parallel on the same sewage. Results of the studies are not yet available for publication.

Prof. A. M. Buswell of the Illinois State Survey, Urbana, Ill., also reported on "THE PHYSICS AND CHEMISTRY OF WATER SUBSTANCE." These studies are being conducted with the use of radar technic and tagged atoms to study the structure of ice and water.

Dr. W. D. Hatfield, superintendent of the Sanitary District of Decatur, Ill., and Director of the Federation of Sewage Works Associations' Research Committee, spoke on the general subject of research and sewage analysis, pointing to the need for improved technics and the need for analytical chemists. He also suggested that sewage chemists needed a good book on the statistical approach to the evaluation of data.

The final paper on the program was contributed by Carl Schwob, Engineer of Public Health Service of Washington, D.C. Mr. Schwob spoke on "THE WATER POLLUTION PROGRAM OF THE PUBLIC HEALTH SERVICE." In short, he outlined the administration setup in the case of the passage of the Stream Pollution Control Bill by the 80th Congress. Inasmuch as the bill has since passed, the development of the administration and the various staffs will become a fact in the future.

HOW MUCH IS "ONE BARREL"?*

The value for one barrel is not a fixed unit. The liquid barrel is not a fixed unit anywhere. No value for a barrel has ever been adopted by Congress in the U.S. and the same is true in Canada. In the Internal Revenue Bureau and in the Custom Service every barrel must be gaged because there is no fixed standard.

Some of the variations are shown in the following table.

Just how all of these various sizes of barrels were arrived at would make interesting reading I dare say. The 42 gal. oil barrel was the result of many years of confusion. Thus in the early days when there was no standard the barrels ranged in capacity all the way from 40 to 55 gallons. Finally, the 40 gallon barrel became most popular, but it was common practice to add 2 gallons for tare or estimated loss during handling, and that resulted in the present 42 gallon size.

In further connection with the oil, here are some figures that may prove to be of value.

Name of Unit	Gallons	Cu. ft.	Bushels	Pounds
U. S. barrel	31.5	4.211		
British Wine bbl.	31.5 also 36			
U. S. Measure	31.0			
Refined Oil Bbl.	42.			
Flour bbl.		3.75	3	
Dry bbl.		26.756	21.5	
Fruit & Vegetable bbl.		4.08		
Beer	36. (can be 2½ gal. short)			
Pennsylvania bbl.	32.			
Beef & Pork				200
Spain Raisen bbl.				100
Malta Customs bbl.	11.4			

One Barrel of	Gravity A. P. I.	Weights Lbs./Bbl.
Crude Oil	36	295.6
Gasoline	60	258.6
Naptha	54	256.9
Kerosene	42	285.4
Solar Oil	40	288.7
Gas Oil	36	295.6
Lubricating Oil	24	318.4
White Oil	28	310.4
Fuel Oil	16	335.7
Road Oil	10	349.9
Grease		315.
Asphalt & Bitumen		364.
Petroleum		300.

*Contributed by W. F. Schaphorst, M. E., Newark, N. J.

Comments of the Editors

"A Day in Danvers"

ONE may wonder why the lead position in this issue has been given to a "sales talk" by Roger Esty of Danvers, Mass., on the versatility of the Hough "Payloader". The answer is that the writer, on a visit to Danvers, spent an interesting and eye-opening day being introduced to methods employed and machines being utilized in construction and maintenance by the Danvers Water and Sewer Dept. Amongst the machines in use was one which was especially impressive because of its adaptability to so many duties and its versatility. To this machine the writer applied the term "A Machine of 101 Uses" and especially requested Supt. Esty to benefit our readers by giving us an illustrated article showing some of its more common uses. Hence the present article.

The article was referred to as a "sales talk" simply because the enthusiastic endorsement of the "Payloader" by Mr. Esty should sell a number of water and sewage works managers on the great usefulness and value of such a piece of equipment in every day operation and maintenance of water and sewer systems. Especially should this be true at this time when manpower is a problem of such magnitude as is the strain on budgets which cannot be stretched.

The decision to write about "A Day in Danvers" was brought about as the result of Mr. Esty's story which brought back memories and impressions from a day spent in Danvers when the writer attempted to follow Sup't. Esty around. It was quite a day in mid-February, with an accumulated snowfall of already more than 10 feet—and more to come.

To start with we had just driven in late from the Maine Water Utilities Ass'n. meeting in Portland and had hardly "hit the hay" when a three-alarm fire got Sup't. Esty into his snow boots and out for most of the night, but well satisfied with snow clear hydrants that were in good working order and amply sustained nozzle pressure. After an hour or two of "shut-eye" the imperative problem of the day was frozen services. Three were quickly thawed in almost no time with Danvers trailer mounted welding machine. One service had burst deep under a snow-clear highway, and it seemed that no rock could have been tougher than that frozen sand-clay earth through which the air operated paving breakers had to penetrate for more than four feet—seemingly an interminable job which went late into the night. Danvers trailer mounted air compressor was hard at it for many hours—another piece of indispensable equipment. Then it was that I also got my first introduction to the "Payloader" and had a chance to see this one-man operated machine at work moving snow in an impressive way.

After this came the much looked-forward-to visit to Danvers compact and modernly equipped meter shop, described in the 1946 Reference & Data Number of *Water and Sewage Works* (p. R.-121, April 1946), where meter testing, repair and checking were under way under supervision of Ass't. Supt. Nelson Boardman. And then came the eye-opening experience of looking over several more of the 27 pieces of construction, maintenance and repair equipment owned by the Danvers Water and Sewer Dep't., amongst which were two types of trenching machines.

We daresay that Danvers, with its 27 pieces of equipment representing an investment of $60,000 approximately, and a population of but 14,700, probably holds the palm as the most completely equipped Water and Sewer Dep't. of any in the country of equal size. Asked for the "formula" which makes this possible, Sup't. Esty explained that since the Water and Sewer Dep'ts. had been consolidated under a single department purchases of labor and time-saving equipment had been materially facilitated. In effect the Water and Sewer Dep't. is in the contracting business while presently putting through a $1,500,000 sewer construction project, thereby rendering it sound economy to purchase money and time-saving machines and equipment of value in water supply maintenance and construction as well as in sewer construction. We understand that the Danvers equipment is all owned by the Water Division, which charges the Sewer Division a rental fee for its use in sewer construction.

Sup't. Esty, like some other forward looking water and sewage works managers, states that he is convinced that the day has arrived when the greater use of machines in water and sewage works construction and maintenance has become imperative both from the standpoint of getting work accomplished and the matter of getting it done at the least overall cost. As to the matter of finding the money with which to purchase these labor and cost reducing machines, it is of interest that many companies are now selling expensive equipment to municipalities on a socalled rental basis. In effect, if the funds are not available for an outright purchase the seller will enter into an annual rental contract for a given machine or piece of equipment. When the accumulated rental paid equals the cost of the machine it becomes the property of the renter. Naturally, the seller welcomes at any time during the life of the rental contract payment of the balance due on the piece of equipment; and, in turn, the renter saves the interest charge on the unpaid balance which is included in the annual rental charge.

Now that the rental scheme (in reality an installment purchase plan) is available to municipalities that would do well to purchase labor and cost saving machines, this method of procurement should prove of especial interest to the smaller cities and towns that otherwise might find an immediate outlay of the full purchase price of such machines difficult or at best questionable in the minds of certain important but short-sighted tax payers.

Get Out the Scrap!

NOW while prices for scrap metal of any sort are probably as high as they may ever be; and, now while foundries are sorely in need of all the iron and steel scrap that can be had, it definitely is the time to fine-tooth comb every water and sewage works property for scrap metal of all kinds. It is surprising what can be found when a start is once made.

The pipe and valve foundries will in particular welcome your scrap, giving the highest obtainable prices for all usable material. It is our understanding that water and sewage works managements can deal directly with the foundries producing water and sewage works equipment, but before making any shipments it would be advisable to check this matter with the producers to whom you wish to ship the scrap.

Scrap brass, bronze and copper is also at an all-time high and some very impressive figures covering income from scrap sales were recently discussed by two water superintendents in the presence of the writer. What did they do with the money? It is ear-marked for the purchase of new equipment.

L. H. Enslow

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The Comminutor, compact, economical, silent, does away with the need for screens, rakes, grinders, burial pits and incinerators or other means of destroying the filth that is obtained by the old methods. With no screenings to stand in the open, there is no odor, no additional labor, and none of the unsightliness usually connected with screenings and their disposal.

The sturdy construction of the Comminutor is the result of long experience. The drum is a single casting, precision machined to close tolerances. Cutting bars, combs and teeth are firmly seated, yet easily removable for sharpening or replacement. They are staggered and distributed to effect multiple small shearing actions. This, plus inertia of the drum in motion, and gearing, allows use of small motors with consequent power economy. No housing is required for the Comminutor.

The Chicago Pump Company Comminutor is the result of many years of research and trial. "Bugs" in early models have long been eliminated so that the machines in use for many years have established an incomparable record of successful performance in the field.

If you have work in the sewage treatment field, write today for the Comminutor Bulletin which gives complete engineering data.

CHICAGO PUMP COMPANY

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Rugged Quality
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MEETINGS SCHEDULED

SEPT. 1-2—WINNIPEG, CAN. (Royal Alexandria Hotel)
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 416 Flour Exchange, Minneapolis, Minn.

SEPT. 14-15—DES MOINES, IOWA (Hotel Kirkwood)
Iowa Sewage Works Association. Sec'y-Treas., Leo Holtkamp, P. O. Box 310, Webster City, Iowa.

SEPT. 14-17—NEW YORK, N. Y. (Hotel Pennsylvania)
New England Water Works Association. Sec'y, Joseph C. Knox, 609 Statler Bldg., Boston, Mass.

SEPT. 14-17—NEW YORK, N. Y. (Hotel Pennsylvania)
New York Section A.W.W.A. Sec'y, R W. Blanchard, 50 West 50th St., New York, N. Y.

SEPT. 16-17—CHEYENNE, WYO. (Hotel Plains)
Rocky Mountain Section A.W.W.A. Sec'y, O. J. Ripple, 710 Colorado Bldg., Denver 2, Colo.

SEPT. 21-22—LAFAYETTE, IND. (Memorial Union Bldg. Purdue Univ.)
Fourth Industrial Waste Utilization Conference. Chairman, Prof. Don E. Bloodgood, School of C. E., Purdue Univ., Lafayette, Ind.

SEPT. 22-24—FLINT, MICH. (Hotel Durant)
Michigan Section A.W.W.A. Sec'y, Raymond J. Faust, State Dept. of Health, Lansing, Mich.

SEPT. 22-24—ATLANTA, GA. (Ga., Institute of Technology)
Georgia Water & Sewage Association and **Georgia Water & Sewage Works School** (17th Annual Meeting). Sec'y, Van P. Enloe, R. F. D. 7, Box 372, Atlanta, Ga.

SEPT. 23-24—MINOT, NO. DAK. (Clarence Parker Hotel)
North Dakota Water & Sewage Works Conference. (20th Annual Convention.) Sec'y-Treas., Jerome H. Svore, State Health Dept., Bismarck, N. Dak.

SEPT. 29-30—CLARKSBURG, W.VA. (Stonewall Jackson Hotel)
West Virginia Section A.W.W.A. Sec'y, John B. Harrington, State Dept. of Health, Charleston, W. Va.

SEPT. 30-OCT. 2—CLARKSBURG, W.VA. (Stonewall Jackson Hotel)
West Virginia Sewage & Industrial Wastes Association. (Annual Meeting) Sec'y, R. G. McCall, Room 643, Capitol Bldg., Charleston, W. Va.

SEPT. 30-OCT. 1—SIOUX FALLS, SO. DAK. (Carpenter Hotel)
South Dakota Water & Sewage Works Conference. Sec'y, W. W. Towne, State Board of Health, Pierre, So. Dakota.

OCT. 5-6—FORT DODGE, IOWA (Hotel Wahkonsa)
Iowa Section A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

OCT. 7-8—MANSFIELD, OHIO (Mansfield-Leland Hotel)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 3, Ohio.

OCT. 10-13—GALVESTON, TEXAS (Buccaneer Hotel)
Southwest Section A.W.WA. Sec'y-Treas., L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 13—FRYEBURG, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Water District, Winthrop, Me.

OCT. 13-15—ATLANTIC CITY, N.J. (Haddon Hall)
Pennsylvania Water Works Association (52nd Annual Meeting). Sec'y, E. R. Hannum, P. O. Box 315, Windber, Pa.

OCT. 13-15—BOSTON, MASS. (Statler Hotel)
American Society of Civil Engineers. (Fall Meeting.) Asst. Sec'y, Allen Wagner, 33 West 39th Street, New York 18, N. Y.

OCT 13-15—MONTGOMERY, ALA. (Whitley Hotel)
Alabama-Mississippi Section A.W.W.A. Secy'y, John L. Snow, First National Bank Bldg., Montgomery, Ala.

MEETINGS SCHEDULED

OCT. 15-17—PHOENIX, ARIZ. (Hotel Westward Ho)
Arizona Water & Sewage Works Association and **Arizona Section A.W.W.A.** Sec'y, Helen Rotthaus, Sanitary Engineering Div., State Capitol, Phoenix, Ariz.

OCT. 17-20—BOSTON, MASS. (Copley Plaza Hotel)
Public Works Congress. Executive Director, Donald F. Herrick, American Public Works Association, 1313 East 60th St., Chicago 37, Ill.

OCT. 18-20—PITTSBURGH, PA. (Hotel Wm. Penn)
Engineers' Society of Western Pennsylvania. (Ninth Annual Water Conference) Chairman, H. M. Olson, 171 Longue Vue Drive, Mt. Lebanon, Pa.

OCT. 18-21—DETROIT, MICH. (Hotel Statler)
Federation of Sewage Works Associations. Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
Michigan Sewage Works Association. Sec'y-Treas., R. J. Smith, 545 Elizabeth St., E. Lansing, Mich.

OCT. 20-22—PHILADELPHIA, PA. (Hotel Penn Sheraton)
4-States Section A.W.W.A. Sec'y, W. A. Welch, 748 Public Ledger Bldg., Philadelphia 6, Pa.
(Joint Meeting)
Western Penna. Section A.W.W.A. Sec'y, L. S. Morgan, State Department of Health, Greensburg, Pa.

OCT. 24-26—JEFFERSON CITY, MO. (Hotel Governor)
Missouri Section A.W.W.A. Sec'y, W. A. Kramer, State Office Bldg., Jefferson City, Mo.

OCT. 25-26—RICHMOND, VA. (Hotel John Marshall)
Virginia Section A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

OCT. 25-29—STATE COLLEGE, PENNA. (Nittany Lion Inn)
Pennsylvania State College Water Works Operators School. Director, R. E. Stiemke, Dept. of Civil Engineering, State College, Pa.

OCT. 26-27—SPRINGFIELD, ILL. (Leland Hotel)
Illinois Water Works Operators' Association. Sec'y, C. E. Corrington, Clinton, Ill.

OCT. 27-29—RIVERSIDE, CALIF. (Mission Inn)
California Section A.W.W.A. Sec'y, H. C. Medbery, Water Department, 425 Mason St., San Francisco, Calif.

OCT. 28-29—LA CROSSE, WIS. (Hotel Stoddard)
Wisconsin Section, A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison, Wis.

NOV. 1-3—OTTAWA, CAN. (Chateau Laurier)
Canadian Institute on Sewage & Sanitation. Sec'y, A. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

NOV. 4-6—ATLANTIC CITY, N.J. (Madison Hotel)
New Jersey Section, A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N. J.

NOV. 8-10—ASHEVILLE, N.C. (Hotel George Vanderbilt)
North Carolina Section A.W.W.A. Sec'y, G. S. Moore, Supt. Water & Light, Albemarle, N. C.
and
North Carolina Sewage Works Association. Sec'y-Treas., G. S. Moore, P. O. Box 125, Albemarle, N. C.

NOV. 8-12—BOSTON, MASS. (Sessions-Mechanic Bldg.)
American Public Health Association. Sec'y, Dr. Reginald M. Atwater, 1790 Broadway, New York 9, N. Y.

NOV. 18-20—PANAMA CITY, FLA. (Hotel Dixie Sherman)
Florida Section A.W.W.A. Sec'y, S. K. Keller, Box 151, Clearwater, Fla.

DEC. 8—WATERVILLE, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Water District, Winthrop, Me.

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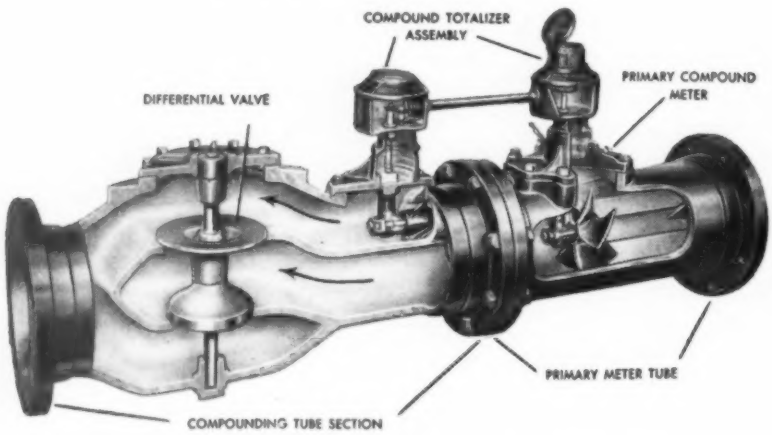

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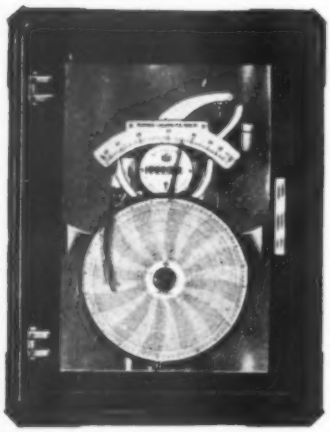

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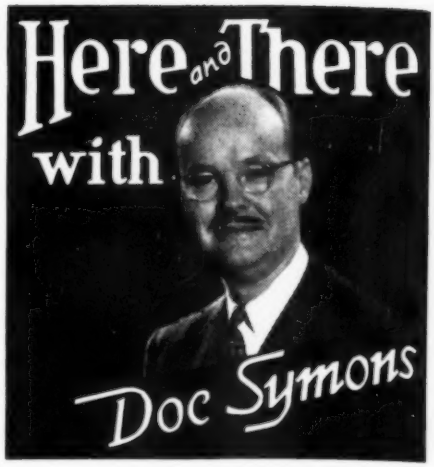

H.T.M.A.—And I'll let you in on a secret. Inasmuch as a number of you have been concerned about that vacation I've been going to take for some time, I'll confess that I did this column at the same time I did the one for August—Had to, because we changed printing schedules again and it was necessary to do two issues in one month. So the vacation will come some time in August—I hope—Meanwhile let's take one more backward look at the A.W.W.A. Convention in Atlantic City.

* * *

When the attractive Norma Nelson of the Halifax (Nova Scotia) Water Dept. finished her story of the wonderful job of public relations being done there (and of the pretty girls in their office); some one near me remarked, "Next time some one tells me to 'Go To Halifax,' believe me, I'll go."—Nice job of selling, Norma.

* * *

At the Wednesday night entertainment (where I was the only one in a tuxedo, besides the orchestra—but then I, too, had been working that night, having given, once again, my verbal editorial on Public Relations, this time before the Pa. Mun. Auth. Assn.) a funny thing happened (If you can follow me).

The act on the stage was a burlesque of interpretative dancing, and the male dancer called for a lady partner from the audience. I don't know who the lady was, but she was a good sport who gamely resigned herself to the shenanigans and girations she was put to. As a climax, the man picked her up to his shoulders and spun her around several times. When he put her down he reached to the floor and picked up a pair of pink silk panties, which he handed to her as she left the stage, much to the amusement of the audience. Only a few of the cash customers, however, heard the really

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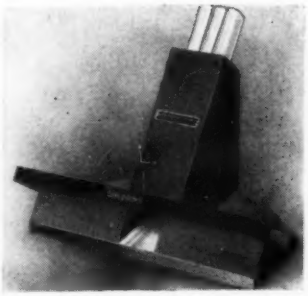

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Nine color standards, a complete set for any one determination, are permanently enclosed in a plastic slide eliminating the cost and difficulty of handling single standards. Accuracy is assured by the Taylor Liquid Color Standards which carry an unlimited guarantee against fading.

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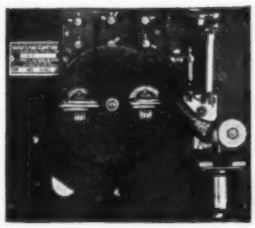

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Type "A" Roto-Trol operates from the pressure in the pump discharge line, at the pump house. The electric time delay prevents starting or stopping due to surges. It also protects deep well turbines from damage due to back-spin . . . *Type "A" Multi-Pump Roto-Trol* is designed for two or more pumps discharging into the same discharge pipe. Adjusted time delays compensate for additional pumping friction and surges when second pump starts or stops.

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tummy part of the act.—As she descended the stairs from the stage, panties in hand, she was heard to remark, "But I didn't have any on."

* * *

Funniest story at the convention was told by Walter S. Byrne, Mgr. of the Omaha, Neb., Water Util.—I know that Jack Service has already told the story in his "Sparling Metrograms" but maybe some of my readers don't see the stuff Jack writes (It's good, too).—Anyway, Walter was talking on the use of paid advertising in a public relations program. "You can be more sure of the handling of your story in the press," he said, and to illustrate the point he cited the case of a feature story about five veterans who had purchased an old mill. They planned to refurbish the water wheel, install a dynamo and sell power to local small industry. When the mill was ready to go into operation, they made a deal with the local weekly newspaper to print the story on the front page, complete with headline and pictures.

Came the day for publication, and the editor found he had another really hot local interest story — the local banker, just turned 78, was to marry his 25-year-old secretary that same day and wanted the wedding pictures on the front page. Never one to haggle with the mortgage holder, the editor did the best he could. It was too late to make over the entire front page, so he slipped the wedding pictures into the front page story on the mill. The banker got the pictures, the veterans got their headline. The headline read — "Old Power Plant Resumes Operation Today."

* * *

Guess I forgot to tell you in June, that Mr. and Mrs. F. J. (Joe) Reny had to cut their trip to Atlantic City short, because Mrs. Reny fell and broke her arm on their first day at the convention — Everything O.K. up Portland way now, Joe?

* * *

When I was mentioning the people I missed seeing at Atlantic City, I forgot to mention Bob Quinn (The Mathieson Man) from Florida. He's quite an active guy in the Compressed Gas Mfrs. Assn.—And I also missed seeing Da-i-s-y June Patchen, whose husband, C. B., used to be Supt. of the Mason City, Iowa, Water Works (that's where Meredith Willson, the orchestra leader, is from) and whose name (Patchen) I misspelled last time I mentioned it, and whose former home I put in Michigan. Boy when I mess 'em up, I really do a job, don't I? Wish I knew where they live in California now.

* * *

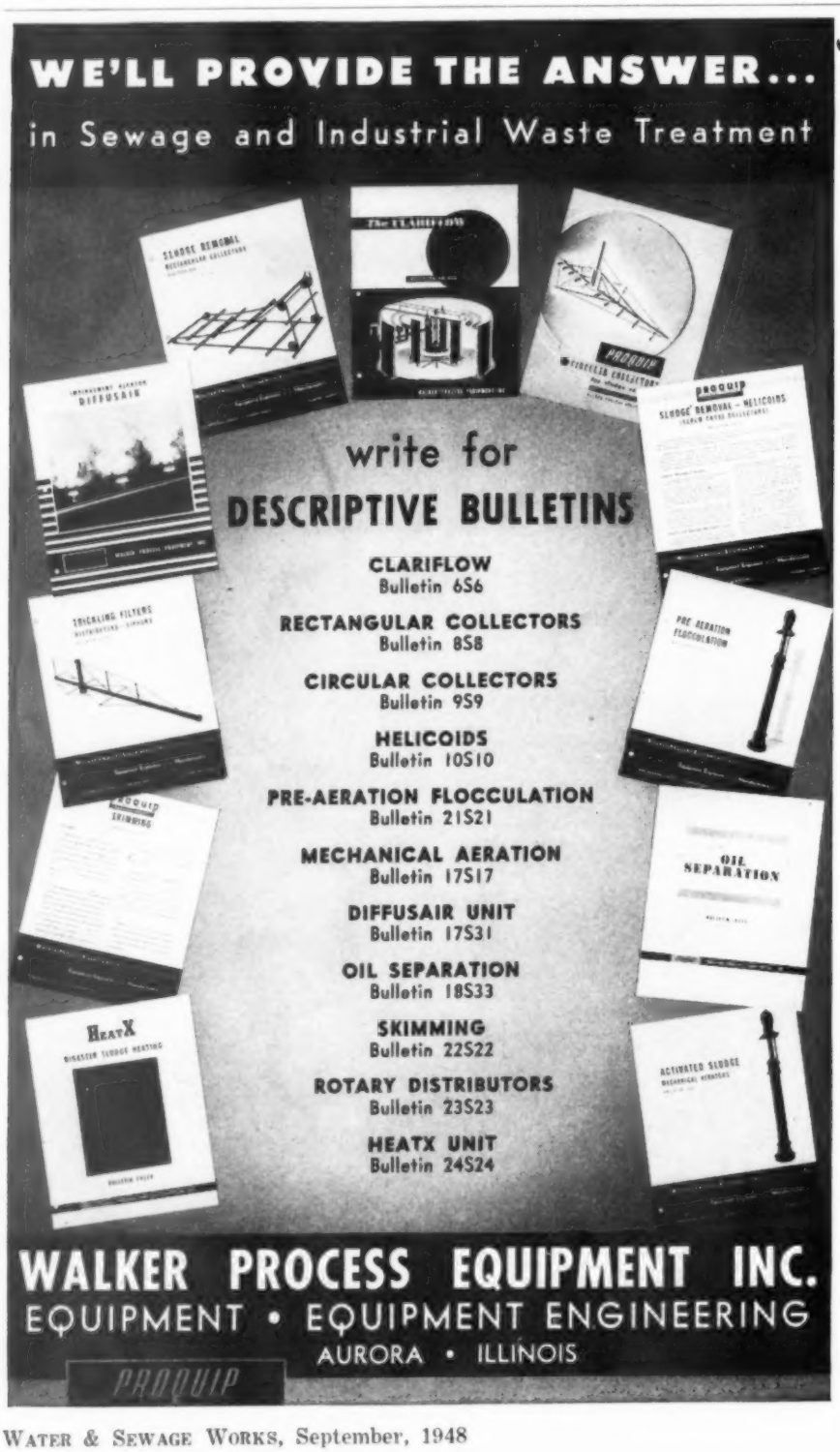
I found out that Earnest Boyce, Head of Civil Engr. Dept. at the University of Michigan, reads my column. First time he saw me at the presidents' reception, he came up and said, where is that special lapel label you say you always wear? I had it—right in my pocket, at the moment.

* * *

On the last morning of the convention, when it was raining like H outside, I had a lot of fun talking to Sadie Hess of the Boardwalk Photographer Fred Hesses about the business of taking pictures at conventions. It was she who told about the difficulty they had getting a model to pose in the Culligan booth, where the super soft water was on display, and how Paul Groeschel of Culligan wanted to borrow the girl from the Nuchar booth, much to the dismay of the activated carbon representative who had doubts as to whether or not the girl would be returned.

* * *

When Wm. C. Morse, from the Seattle Water Dept., heard "Gerry" Arnold, Dir. of San Diego's Water



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Dept., put in a plug for the use of reservoirs for recreation purposes, he, Morse, said that "Gerry" reminded him of the fox that had lost his tail and tried to convince all of the other foxes that it was the only way to be.

* * *

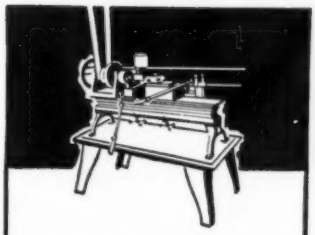
That just about winds up the story on Atlantic City except for this little warning. When and if you go down there again, keep your sharp eye out for the sharpers. Little things like this can happen. On the rolling chair ride, my girl gave the pusher her ticket, while waiting for Marion Weir to join her. The pusher turned the ticket in, came back, took the two girls for their ride, collected Mrs. Weir's ticket and demanded another fare from my girl. No amount of argument with the pusher or the manager did any good, and rather than develop another ulcer, "Gin" paid the buck.—I'm still mad—It just goes to show you that you'd better watch out or some one will do you out of something while you're being a trusting individual. Sort of depresses your faith in human nature, but we live in the world.

* * *

In July 1947, I mentioned that I wanted to organize a club, to be called the **N**imble **O**rder of **B**um **D**igits or the **NOBD,** pronounced nobbed. The sole eligibility requirement is that you have some part of at least one finger (or thumb) missing, as the result of an accident. All persons with such accidental amputations as of July 1 of this year are eligible to charter membership.

Purpose of the club is to call attention to accident prevention, and the motto is, "Safety First—Don't be a NOBD".

Here is the list of charter members to date: B. A. Poole, Director, Bureau of San. Engr., Indiana Bd. of Health, Indianapolis; W. D. Sheets, Supt. of Water and Sewage, Worthington, Ohio; C. C. "Swede" Larson, Supt. of



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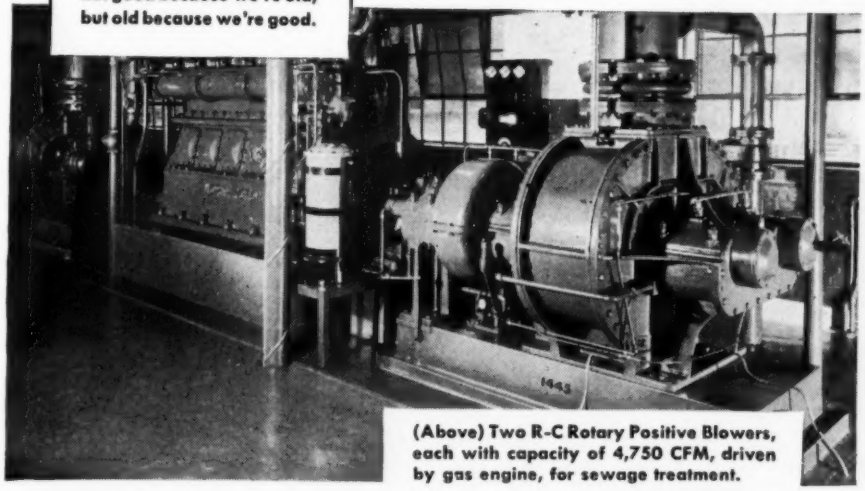
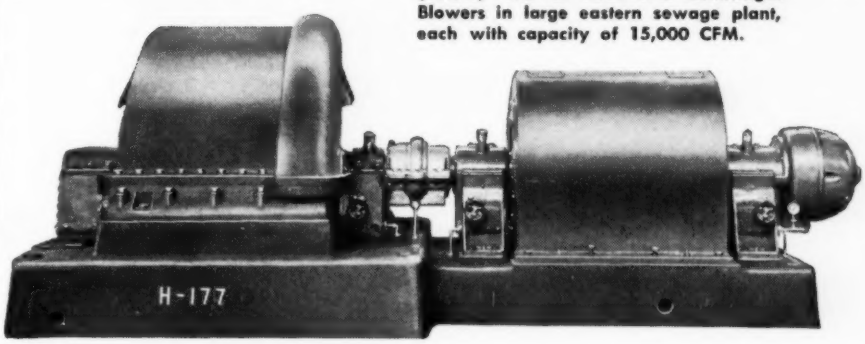


(Above) Two R-C Rotary Positive Blowers, each with capacity of 4,750 CFM, driven by gas engine, for sewage treatment.

(Below) One of three R-C Centrifugal Blowers in large eastern sewage plant, each with capacity of 15,000 CFM.



You obtain an important, exclusive advantage when you consult us about problems of moving air or gas. That is, our *dual-ability* to supply either Centrifugal or Rotary Positive units.

This *dual choice* allows you to match equipment exactly to your needs, in capacities, pressures and other characteristics. You can have standard Rotary Positive units from 10 CFM up to 50,000 CFM, or Centrifugal units from 2,000 CFM up to 100,000 CFM. You save time, trouble and money by using one supply source.

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* * *

In case you ever hear the story of the mint julep drinking contest as told by Gus (Balto. Cons. Engr.) Requardt, just remember that Frank Friel (Phila. Cons. Engr.) says it was his grandfather who won that contest in 1866.

* * *

It's been some time since the famous Sam Newkirk (an A.W.W.A. Past President and Engr.-Supt. of Elizabeth, N. J., Water Comm.) appeared in this column and it's about time for another "Sam II" story.

It happened at Paterson, N. J.—The No. Jersey Water Supts. Conference was holding one of its unique and highly interesting meetings. Harry Lendall (Prof. at Rutgers and Educ. Dir. of the No. Jersey Conf.) together with "Sig" (Nuchar) Sigworth and—gosh, I've forgotten—inveigled Sam Newkirk into a game of Chinese Bridge. Sam, who insisted that he had never played the game before, won all the pennies.

"Beginner's luck" cried the others. Well now, Sam was telling the truth when he said he had never played the game before, but what his opponents didn't know was that on innumerable occasions Sam had watched the game played by a couple of his cronies.

Don't go 'way folks, I have one more story on Sam; a story to end all stories on Sam Newkirk. Watch for it sometime.

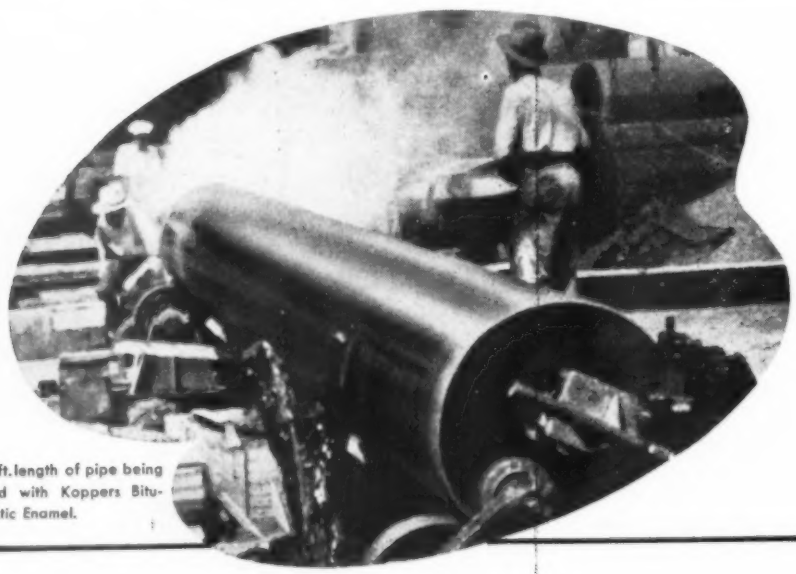
* * *

I note from the *New York Daily News* that another columnist besides me writes about persons in the fields of water and sewage treatment. In the *Powerhouse* by Jimmy Powers for April 12, I saw that "Typical of those we [Powers] met cruising the Willowemoc" fishing for speckled trout was among others, "Jack Van Atta, Hackensack Pump Manufacturer." That would be Jack (R. B. Carter) Van Atta who is one of the members of the Society of Council Bluffers.

Fred Stuart of Baltimore (the Activated Alum Boy) whose name also appears in this column on occasion also made the *Powerhouse* when Jimmy Powers was writing from Florida one time.

* * *

I still think that one of the most amusing occurrences at a convention happened at the meeting of the Pa. Water Works Operators two years ago. During the announcements of dates for future meetings, H. M. Olson (Ohio Salt Co.) asked for the floor and gave the dates of the meeting of the Engineers' Society of Western Penna. He was followed by someone else and then up spoke Ben Barton of Findlay, Ohio, who reminded every one of the Ohio Conference on Sewage Treatment. This kept up for several minutes when up stood R. C. (Dick) Beckett, Chief Engineer of the Delaware State Dept. of Health. The irrepressible Dick came out with, "Three of our water works operators are getting together in December, and everybody's welcome."



30-ft. length of pipe being lined with Koppers Bitumastic Enamel.

No perceptible change in this pipe's flow capacity after 16 years' service!

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Flow tests of this pipe-line—conducted over a period of 3 hours—gave coefficients of friction up to 145.8 (Williams & Hazen formula). Tests were again made after 8 years' continuous service, and the coefficients of friction varied between 145.5 and 151 . . . even better flow. And today, meter readings indicate that flow capacities are still equally high. The performance of Panther Valley's 16-year-old pipe-line is additional proof that Koppers Bitumastic Enamel provides long-lasting protection against corrosion, rust and tuberculation.

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That about brings me up to date, except for a very interesting meeting in Cincinnati in June, and of course I picked up some very amusing stories at the Milwaukee meeting of the Central States Sew. Wks. Assn.—Met some delightful persons, too, one of whom—but that's a story for October. —See you then. Thanks for listenin' —V.T.Y.—Doc.

THE SPILLWAY

[Overflow from the main section]

Metropolitan Section N.Y.S.S.W.A.

The Metropolitan Section of the New York State Sewage Works Assn. held its third meeting since its organization last January. This meeting on June 9 was devoted to the subject of Air Diffusion in Activated Sludge Treatment.

Otto Stack, sales development engineer of Porous Plates and Refractories Division of the Carborundum Company, reviewed the history of "POROUS CERAMIC DIFFUSERS." According to Mr. Stack, after the initial development of this type of diffuser the next step was to increase the porosity of the diffuser from 20 to 40. The next thing was to decrease the bubble size. Recent developments have increased the permeability from 60 to 80. Mr. Stack pointed out that it was the porous tube which had made the swing type diffuser economically possible, that porous ceramic diffusers had wide application, and that the material from which they were made would always be available.

Frank Roe, at that time Eastern Manager of the Chicago Pump Co.,

Speed up Jointing
OF YOUR BELL and SPIGOT WATER LINES
and get lastingly tight joints...
with these Advantages
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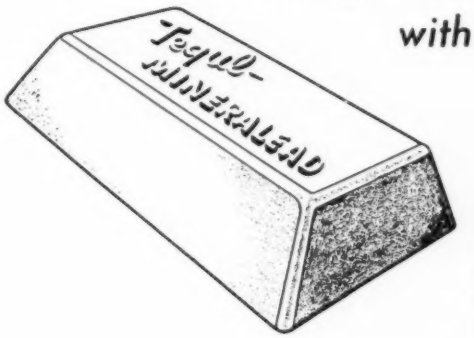

Tegul-MINERALEAD sidesteps trouble met with in some jointing compounds. Its correct composition is never upset as the result of rough travel between plant and job. No amount of jolting can "shake down" an ingot.

Also the ingot is more convenient to ship, store and handle, is impervious to moisture so may be stored unprotected in the open without fear of rain or flood. It melts and pours easily. Less initial leakage and, due to plasticising with synthetic rubber, has super resistance to mechanical and thermal shock. Joints made with *Tegul*-MINERALEAD have ample flexibility to meet vibration and to permit line to adjust to any normal settling of terrain.

Tegul-MINERALEAD is easy—and clean to work with. Economical too—needs no skilled labor, caulking or deep bell holes.

THE HYDE-RO RING is a simple, easily applied rubber device which makes a quick seal, makes repeated hypochlorite flushings unnecessary, prevents recontamination of the line — and speeds repairs by giving dry joints.

The Hyde-Ro Ring works with plain or bead end pipe and with *Tegul*-MINERALEAD, lead and Portland Cement. Made for diameters from 4 to 12" and packed fifty rings of a size to carton.

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spoke on the wide band diffuser system. He reviewed its development and also discussed the new precision type swing diffuser made from stainless steel and wound with Saran cord.

In the course of the discussion which followed these two papers other types of diffusers and plate holders were discussed as well as the virtues of mechanical aeration versus diffused aeration.

In the absence of program chairman William C. Raisch, Consulting Engineer of New York City, the evening question period was presided over by George E. (Doc) Symons, Associate Editor of *Water & Sewage Works*, New York City.

Manufacturers to Exhibit at N.E.W.W.A. Meeting

Fifty-one members of the Water and Sewage Works Manufacturers' Association have reserved exhibit space at the forthcoming convention of the New England Water Works Association, to be held at the Hotel Pennsylvania, New York, on September 14-17.

Ground Water

"Ground Water, Its Development, Uses and Conservation" is the title of the book authored by E. W. Bennison, Editor of *Johnson National Drillers' Journal*.

This book consists of a series of articles which appeared in the *Johnson National Drillers' Journal* for March, 1940 to July 1946. This journal is published by Edward E. Johnson, Inc., mfrs. of welded well screens and accessories. Mr. Bennison is office engineer of the company.

The book contains 18 chapters covering materials on such items as the origin of ground water, porosity and permeability of water bearing rocks, the water table, prospecting, construction of wells, drilling machines, hydraulics of wells, development of wells, pumping equipment, etc.

"Ground Water, Its Development, Uses and Conservation," first edition, contains 509 pages and is published by Edward E. Johnson, Inc., St. Paul 4, Minnesota.

W. H. Waddell Dies

W. H. Waddell, City Engineer of Owen Sound, Ontario, Canada, died early in June. Mr. Waddell is a past-chairman of the Canadian section of the American Water Works Association, having held the chair in 1945-46.

Annual Reports & Public Relations

Daniel J. Hennessy, vice president and director of the Jamaica Water Supply Co., Jamaica, N.Y., is president of the Controllership Foundation of New York. This Foundation has just issued a bulletin entitled "What People Want To Know About Your Company". The bulletin is a result of the study for the Foundation by Elmo Roper, famous public opinion pollster.

While this study was made primarily for stockholders in private corporations the interest of persons in such groups with respect to annual reports of private companies may give a key to what people are generally thinking about annual reports, according to Mr. Hennessy.

(*Continued on page* 105A)

IT TAKES A FLAME TRAP THAT STOPS FLAMES . . . . . BUT NOT GAS FLOW!

In any sewage treatment plant, the quantity of gas generated is the all-important factor in sizing piping and appurtenances. For economical design, a flame trap installed in a gas line should be the smallest size that will permit the required gas flow at the lowest possible pressure. By actual test, "VAREC" Flame Trap Assemblies have high flow capacity with low pressure drop thus enabling you to use smaller size units. The flame trap grid is the same as that used in the "VAREC" Approved Flame Arrester which is listed by the Underwriters' Laboratory for protecting gasoline storage tanks from flame flashback Therefore, you get the utmost in safety and economy with the 'VAREC" Flame Trap Assembly, Figure No. 450.

FIG. NO. 58C

FIG. NO. 440

FIG. NO 70

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WATER & SEWAGE WORKS

Will see that you receive information desired.

As a result of this study the report prescribes a far simpler summary for the 50 to 75 percent of shareholders who are not interested in, or unable to understand, detailed statistics and accounting terminology included in a full-scale annual report.

According to Mr. Hennessy, the report included some evidence that the run-of-mine stockholder is "not an avid consumer of information about the companies he owns stock in." If this is true then certainly municipally owned water companies will find very little interest on the part of their owners. An annual report, particularly one detailed either as to financial consideration or operating statistics, will find little interest in the consuming public. According to Mr. Hennessy the brief version of the annual report, with tables expurgated, apparently appeals to employees the same way it does to stockholders. This type of report promises more comprehensible answers to the few questions both groups have about company finances and policies. With very little shift of emphasis this idea could be transferred to annual reports of municipal water and sewage plants.

Persons interested in the Controllership Foundation Survey might write to G. K. Dahl, Director of Public Relations, Controllership, Inc., 1 East 42nd St., N.Y. 17, N.Y.

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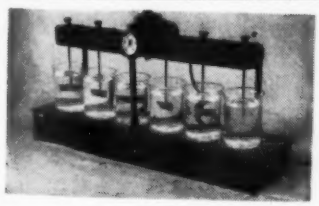

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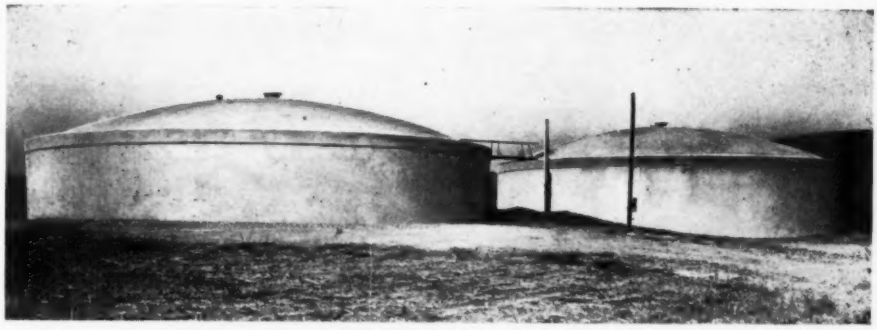

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Our experience in the field includes scores of tanks and silos of many types ranging up to two and one-half million gallons capacity. Prestressed "GUNITE" tanks are also being constructed for sedimentation purposes, sludge storage, etc.

Our 72 page Bulletin C2300 describes this method of construction fully and also other uses of "GUNITE."

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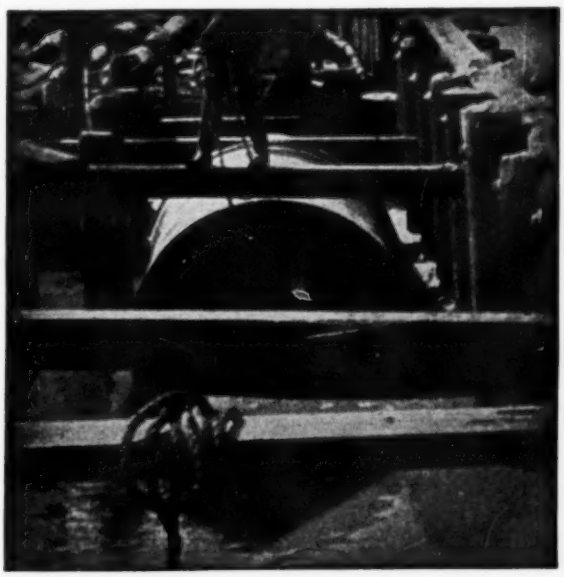

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American Chemical Society Divides Its Meeting

According to an announcement of Dr. Charles Allen Thomas, president of the American Chemical Society, it is expected that fifteen thousand chemists and chemical engineers will participate in the 114th national meeting of the American Chemical Society this year. This meeting will be held, not in one single place, but in three sessions, one in Washington, D.C.; one in St. Louis, Mo., and one in Portland, Ore.

The Eastern Session, in Washington, runs from August 30 to September 3; the Midwest Session, in St. Louis, from September 6 to 10, and the Western Session, in Portland, from September 13 to 17.

This divided national meeting is the first in the history of the seventy-two-year-old society. It was arranged in order to enable the maximum number of 57,000 members to attend. A total of 120 technical sessions will be held in the three meetings.

The Washington session will feature the chemistry of agriculture. Three of the seven awards of the society will be given at that session. The St. Louis meeting will feature relationship of fuel properties to engine design, high octane gasoline, developments in municipal water purification and research in high polymers. Municipal and industrial water and sewage treatment will be discussed by the Division of Water, Sewage & Sanitation Chemistry. Three awards of the society will be made at St. Louis.

At the Portland meeting from Sept. 13 to 17 achievements of the nuclear chemist in the field of atomic energy, of the biological chemist in animal nutrition, and of the wood chemist in deriving sugars from wood will be stressed. The fishing industry will also be discussed at this meeting.

FOR TREATMENT OF SEWAGE AND INDUSTRIAL WASTES

Today, stream pollution by sewage and industrial wastes is a more serious problem to engineers and officials than ever before. SOLVAY Liquid Chlorine, SOLVAY Soda Ash and SOLVAY Calcium Chloride have been used successfully in the treatment of such wastes.

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N. Y. S. S. W. A. Holds Panel Discussion

At its annual spring meeting held in Niagara Falls, N.Y., June 3, 4 and 5, the New York State Sewage Works Association had a varied program including industrial waste topics.

Presided over by EDWIN C. MCKEEMAN, Sup't. Sewage Treatment at Freeport, L.I., the program included papers and discussions on leather wastes, de-inking waste, trickling filter operation, and the establishment of sewer authorities, as well as the formulation of policies to control the discharge of industrial wastes into sanitary sewers.

WILLIAM PORTER, Sup't. of Sewerage and Sewage Treatment, Ballston Spa, N.Y., and W. R. SCHREINER, District Sanitary Engineer, N.Y. State Dept. of Health, Glens Falls, N.Y., discussed "Operating Problems from Leather Wastes at Ballston Spa."

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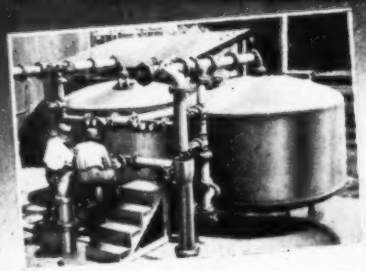

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AGENTS IN PRINCIPAL CITIES

"Treatment of De-inking Waste—Pilot Plant Scale" was presented by PHILLIP F. MORGAN, Chief Development Engineer, Nat'l. Council for Stream Improvement, Kalamazoo, Mich.

EARL DEVENDORF, Assistant Director, Bureau of Environmental Sanitation, N.Y. State Dept. of Health, Albany, spoke on the "Results of Two Year Study of Stream Pollution Control by the State Legislative Committee and Plans of the State Department of Health in Connection Therewith."

EARL F. O'BRIEN, consulting engineer of the firm of Holmes, O'Brien & Gere Consulting Engineers, Syracuse, N.Y., read a paper on "Joint Action by Communities for Pollution Abatement".

"The Formulation of Basic Policies to Control the Discharge of Industrial Wastes into Sanitary Sewers" was the title of a paper presented by THOMAS M. RIDDICK, consulting engineer of New York.

GEORGE H. BUSH, Sup't. Brighton Sewer Commission, Brighton, N.Y., presented a paper on "Trickling Filter Operating Problems".

One of the features of the program was a complete session on Saturday morning devoted to a panel discussion on "SLUDGE DIGESTION TANK HEAT-

LEADITE

The Pioneer Self Caulking Material for C. I. Pipe

YOU CAN'T GO WRONG

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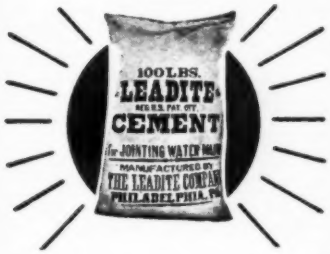

The pioneer self-caulking material for cast iron bell and spigot water pipe which, for more than 50 years, has shown water works men how well it makes a good tight joint that improves with age.

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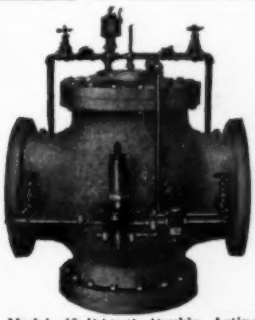
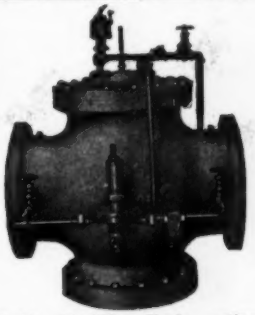
Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

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ING AND RELATED PROBLEMS". This panel discussion was conducted on a somewhat unique line different from most panel discussions previously held. Prior to the panel discussion, the various members of the panel had submitted questions which had been asked of them most frequently in connection with the topic. These questions were then organized into categories of subject matter and given some continuity.

In conducting the discussion, the panel leader, GEORGE E. (Doc) SYMONS, Associate Editor of *Water & Sewage Works*, New York City, asked the questions after which the panel members were called on in the order of their willingness and desire to answer the questions. If, after the answering of any question a member of the audience had a question on that subject, he was permitted to propound it to the panel. This system of prepared and organized questions intermingled with spontaneous questions from the audience produced a lively and well-received program.

Participants in the panel discussion were the following: Paul E. Bardet, Engineer-in-Charge, 26th Ward Treatment Plant, N.Y.; A. J. Fischer, The Dorr Co., N.Y.; George F. Fynn, Chief Chemist, Buffalo Sewer Authority, Buffalo; George W. Moore, District Sanitary Engineer, N.Y. State Dept. of Health, Rochester, and Charles R. Velzy, Consulting Engineer, N. Y.

Manufacturers to Exhibit at Federation Meeting

Twenty-nine members of the Water and Sewage Works Manufacturers' Association have reserved exhibit space for the convention of Federation of Sewage Works Associations, to be held at the Hotel Statler, Detroit, on October 18-21. All exhibit space available for this convention has been reserved.

Royer machine at Monroe, Michigan, turning waste sludge into profitable fertilizer.

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Who Wants It?

Will the gentleman who sent in a request for items with key numbers 412 and 428, please give us his name and address. We cannot have his request filled without knowing who he is and where he lives. After all, Brooklyn is a big city.

This is the second time within recent months that someone of our readers has sent in requests for information but has failed to put on his name and address.

To those of you who wish to make use of the Reader Service Cards to obtain information on equipment news or catalog items, we should like to direct your attention to the information on the Reader Service Card—"Please fill out a separate coupon for each item on which you desire information . . . please print your name and title, company or department name and your address . . . and enter the key number in the box."

The SEWER SCOOTER

(U. S. Patent 2,198,823)

THE ONLY 100% SELF-PROPELLING SEWER CLEANER

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

A patented feature

No Preliminary Work—
Gets Results in a Hurry

SEWER SCOOTER MODEL A-3, BRONZE

Standard machines stocked 8 inches to 96 inches—For sale, rent or contract.

J. C. FITZGERALD

Box 289-A
Coral Gables 34, Fla.

Faster Cleaning of Felt Filter Cloths

HERE'S a fast, easy Oakite way to clean clogged pores of felt filters. It restores both cloth and drum to full filtering efficiency. Merely rotate drum at full air capacity on all sections through solution of Oakite Compound No. 84. If inert particles are too deeply imbedded in fabric, apply solution through the Oakite Steam Gun. Saves time. Saves effort. Frees filter of dirt and lime. Write for full, free details.

OAKITE PRODUCTS, INC.
73 Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

901

Wiring Test Set

Eastern Specialty Co., Philadelphia 40, Pa., had developed a Wiring Inspector's Test Set shown in accompanying photograph. Large water and sewage plants which have electrical service departments will

be interested in this device which enables one person, without additional help, to make a complete test of the wiring in a building.

The device is housed in a gray fiber carrying case measuring approximately 15 x 7½ x 9 in. Total weight is 13 lb. A compartment provides storage space for the flexible leads and the portable meter. Power is supplied from a standard 6 volt

FEED-METERS-MIXES CHLORINE GAS ACCURATELY

PURIFICATION FOR WATER-SEWAGE & SWIMMING POOLS

Everson SterElators Operate Manually or Semi-Automatically, Also Automatically Proportion Gas Flow to Water Flow.

Everson SterElators Utilize a 24" Water Gauge Vacuum and Visible Flow Meters, with Wide Ratio Ranges of Capacities: 10 to 1, 50 to 1, 110 to 1.

All SterElators Are Dependable, Accurate, Safe and Easy to Operate. Guaranteed to Give Complete Satisfaction. NO JOB TOO LARGE

Send us Copy of Specifications

SterElators by Everson

EVERSON MFG. CORP.
233 W. Huron Street
Chicago 10, Ill., U. S. A.

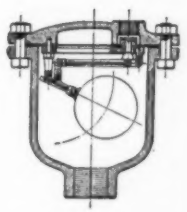
No. 2V-APCO

APCO-V-APCO PRIMERS

AUTOMATIC POWER OR TANK PRIMERS

AIR RELEASE VALVES

FOR
FILTER PIPE LINES—DISTRIBUTION LINES
AND OTHER USES
17 TYPES



No. 200 VALVE

VALVE AND PRIMER CORPORATION 30 W. Washington St., Chicago 2, Ill.

dry cell, which can be easily replaced.

For further information on this unit enter the above key number on a Reader Service Card and mail.

Chicago Bridge Already Enlarging Their New Salt Lake City Plant

Chicago Bridge & Iron Co. has let a contract to the American Bridge Co. for an outside crane runway and Shop Building No. 2 at its new Salt Lake City fabricating plant, which was only completed in June of this year.

The new outside crane runway is 100 ft. wide by 360 ft. long. It will be used to unload incoming steel and pass it into Shop No. 2 or Shop No. 1 as required. Shop No. 2 will be 125 ft. wide by 420 ft. long, and will be equipped with a 20-ton overhead bridge crane.

When Shop No. 2 is complete, the new Salt Lake City plant will be a completely integrated unit, with facilities for fabricating practically all of the Company's diversified line of products. Shop No. 1 is equipped to fabricate flat-bottom tanks, Horton Floating Roofs, reservoirs and other structures of this same general type. Shop No. 2 will be equipped to fabricate "Hortonspheres," "Hortonspheroids," "Hemispheroids," "Waterspheres," "Vaporspheres," modern elevated tanks and other similar structures.

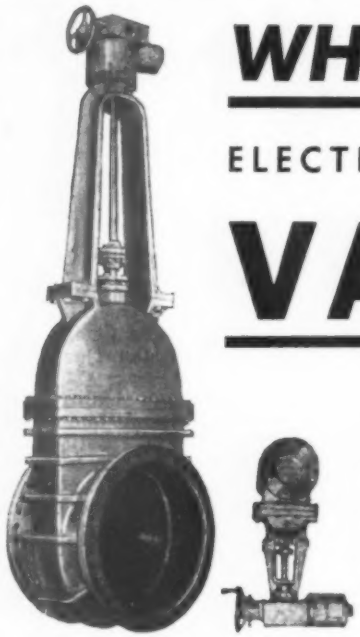
A. N. Hopper, formerly Chief Draftsman for the Company at its Greenville, Pa., plant, is Manager of the new Salt Lake City plant.

AVOID COSTLY MISTAKES

WHEN BUYING

ELECTRICALLY OPERATED

VALVES



The way to avoid costly mistakes in buying motor operated valves is simple . . . make sure that your supplier has had ample experience in this highly specialized field.

Rensselaer Valve Company has had many, many years of experience in supplying such valves for use under a wide variety of service conditions.

Consult our factory-trained representatives or write direct.

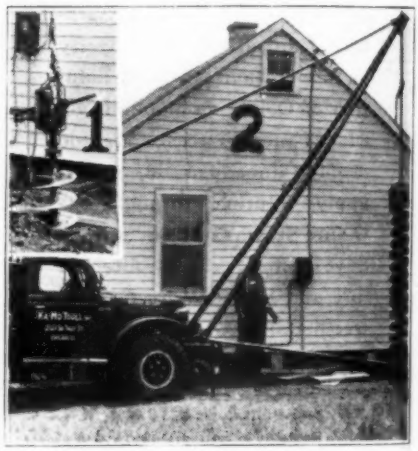
ATLANTA, GA. 333 Candler Bldg.
BALA-CYNWYD, PA. 725 Kenmare Road
CHICAGO, ILL. 53 West Jackson Blvd.
DENVER, COLO. P. O. Box 5270
HAVERHILL, MASS. Haverhill National Bank Bldg.
HORNELL, N. Y. 38 Main St.
KANSAS CITY, MO. 1609 Oak St.
LOS ANGELES, CALIF. Subway Terminal Bldg.
MEMPHIS, TENN. 822 Dermon Bldg.
MINNEAPOLIS, MINN. 625 Plymouth Bldg.
OKLAHOMA CITY, OKLA. 817 Braniff Bldg.
PITTSBURGH, PA. 1401 Oliver Bldg.
SAN FRANCISCO, CALIF. 115 Townsend St.
SEATTLE, WASH. 1252 First Ave., South
WACO, TEXAS 206 Franklin Ave.

RENSSELAER VALVE CO.

902

Wells in a Jiffy

Ka-Mo Tools, Inc., 2121 S. Troy St., Chicago 23, Ill., has developed a new type well driller. Temporary or permanent wells are drilled at the rate of 30 ft. per hr. 16 in. dia. with the drilling outfit illustrated, which can be mounted on any standard truck. This portable drill is designed to pull out the dirt, leaving a clean hole into which a caisson or pipe can be inserted immediately.



(1) Drilling Completed

(2) Drill Lifts Out the Earth Leaving Clean Hole

This is not a conventional type auger, but a drill with exclusive, patented features. Motor and drill are suspended from the boom, a switch is pressed and the drill starts operating. When the drill reaches the desired depth it is pulled out of the hole, carrying all the dirt with it.

Besides drilling for water at desired locations, KA-MO drills are used to make test holes, pilot holes for wooden, cast or poured concrete piling or posts; also for horizontal or angular holes for pipe, drains, conduit, etc.

Drills are furnished in diameters up to 16 in., available in single lengths, or in several multiple units, which can be attached as the work

progresses to reach the final desired depth.

For further information, enter the above key number and your name and address on a Reader Service Card and mail.

903

Laboratory Shakers

Eberback & Son Co., at Ann Arbor, Mich., has announced new laboratory shakers designed to provide the right carrier for individual containers to be shaken, at a variety of speeds to produce the agitation rate required.

The utility shaker is a variable speed model with a utility box carrier for shaking various sizes and shapes. It can take up to a five gal. solution bottle. By changing the platform and using a flask carrier, a number of flasks or bottles can be shaken.

Chemists and engineers in charge of laboratories where shaking of sample bottles and mixing of solutions is a problem, may well be interested in this utility shaker.

For further information enter the above key number on a Reader Service Card and mail.

FOR BETTER
pH Control
and WATER TESTS
there is nothing like

NON-FADING GLASS COLOR STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.

WRITE FOR BULLETIN No. 602

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

How to join more bell and spigot cast iron water mains per hour ...at less cost

ELIMINATE USE OF HIGH PRICED LEAD

Haymanite JOINTING COMPOUND

High lead prices needn't bother you anymore. Use Haymanite. It's inexpensive—goes 4 times as far as lead. Saves 75% of costs.

- Saves time.
- Requires less fuel.
- Reduces handling and transportation.
- No large bell holes.
- Self-sealing if broken.

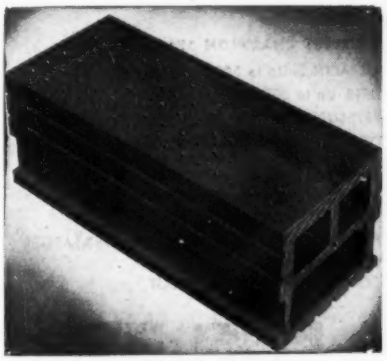
Immediate Deliveries from stock
Free illustrated catalog

Producers also of M. H. Brand Caulking Lead.

MICHAEL HAYMAN & CO.,
INCORPORATED
ESTABLISHED 1869
870 EAST FERRY ST. BUFFALO, N. Y.

Leopold

GLAZED FIRE CLAY TILE FILTER



• Permanent •Non-corrosive • Economical • Impervious to acid or alkali solutions • Practically non-absorbent • Equal distribution.

Complete water purification and sewage plant equipment.

Write today for complete information

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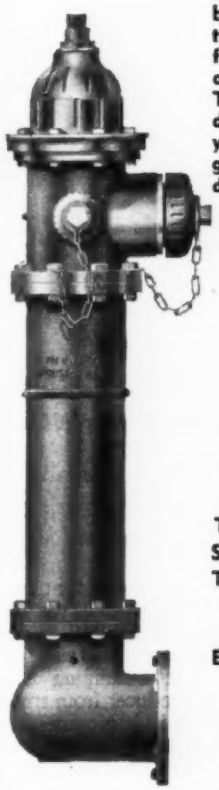
2413 W. CARSON ST. PITTSBURGH 4, PA.

M H

HYDRANTS and VALVES

Expert workmanship and highest quality materials make M & H products a good investment always. Many years of use in all sections of the country has proved their ruggedness and dependability.



M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

Write for Catalog No. 34

M & H PRODUCTS
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

R. P. Logan Joins Dorr Co.

Robert P. Logan has joined the staff of the Dorr Co. as assistant to Dr. Anthony J. Fischer, Chief Sanitary Development Engineer of the company. Mr. Logan has been Assistant Professor and Research Specialist of the Department of Sanitation, Rutgers University, New Brunswick, N.J., for the past three years. Mr. Logan is a graduate of Rutgers (1941) and has a master degree in sanitary engineering from New York University in 1948. He is co-author with Professors Rudolfs and Heukelekian of several technical papers on the treatment of sewage sludges and industrial wastes.

Mr. Logan's headquarters will be in New York, although at the present he is carrying out special field studies for the company on the West Coast.

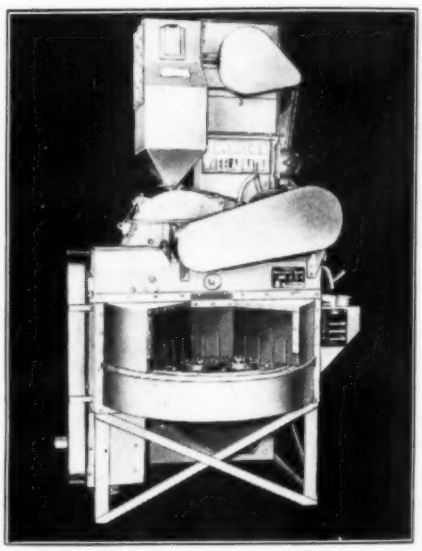
Alhydro Inc. To Represent Palmer Filter Equip.

The Palmer Filter Equipment Co., of Erie, Pa., has appointed Alhydro, Inc., at Baltimore as one of its distribution agents for Palmer Filter Bed Agitators and Anthrafilt filter medium. Alhydro Inc. is the manufacturing company for the Alhydro Floc Producer, the electrolytic method of coagulation recently described in this magazine. The company is located at 516 North Charles Street, Baltimore, Md.

904

Airless Abrasive Blast Cleaning

The American Wheelabrator & Equipment Corp. of Mishawaka, Ind., has introduced a new table-type cleaner which utilizes the centrifugal force, or an airless blast method for cleaning steel and encrustations from surfaces. Shown in the accompanying photograph is the machine recommended by the company for water works which have the problem of cleaning one small size meter. The



company also has equipment which they recommend for plants where there are meters of a wide range of sizes and use.

The principle of operation of the airless wheelabrator abrasive is the centrifugal force which throws the sand or abrasive against the item to be cleaned. The parts to be cleaned are placed on rubber-covered revolving discs which are carried on a circular path through the abrasive blast. The discs revolve automatically to provide complete coverage of the surface of the piece. The airless blast unit is made of steel and cast alloy, through which the abrasive is fed into the center of a bladed wheel. Here it is picked up by the rapidly rotating blades and accelerated until it leaves at velocities of 12,000 feet or more per minute.

After the parts have been through the blast once they are turned over

LOOK TO THE LEADER FOR THE

PEERLESS CHAMPION

PEERLESS DEEP WELL TURBINE PUMP for Small Diameter WELLS

Squarely meets the need for turbine pump utility, stamina and reliability from 4" wells and larger

Here is the Peerless pump that successfully and completely fills the gap often found between domestic water systems and the larger deep well turbine pumps. The Champion is a powerful water producer from small diameter deep wells; it provides unsurpassed water lifting performance for a host of commercial and industrial uses requiring moderate gallonage and a clean water supply. Read the specifications to the right. If you find that the Peerless Champion turbine pump generally meets the water requirements of your business, write for full details, described and illustrated in a new Peerless engineering Bulletin. Do it today!

PEERLESS CHAMPION SPECIFICATIONS:

CAPACITIES: Up to 5000 gals. per hour

LIFTS: Up to 200 Feet

PRESSURES: Up to 90 lbs.

DRIVES: Available with electric head, right angle geared head for use with horizontal driver or Vee or flat belt drive.

WATER LUBRICATED: OPEN LINE SHAFT CONSTRUCTION

FOR 4 INCH DIAMETER DEEP WELLS AND LARGER

TOP FLIGHT PEERLESS QUALITY CONSTRUCTION THROUGHOUT

WRITE FOR BULLETIN B-200

Contains complete pump description, plus valuable engineering and water pumping data. Fully illustrated.

PEERLESS PUMP DIVISION

FOOD MACHINERY CORPORATION

Factories: Los Angeles 31, Calif.; Indianapolis, Ind.

District Offices: New York 5, 37 Wall Street; Chicago 40, 4554 No. Broadway; Atlanta Office: Rutland Building, Decatur, Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California.

ANTHRAFILT
Trade Mark Reg. U. S. Patent Office
A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.
Anthracite Institute Building
Wilkes-Barre, Pa.

All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.
822 E. 8th St. Erie, Pa.
Engineers and Sales Agents

and passed through a second time in order to clean both sides. The abrasive used is chilled iron of small grit size.

These machines are recommended not only for cleaning purposes in large water works but also for meter companies in the production of meters. The company also produces air blast equipment.

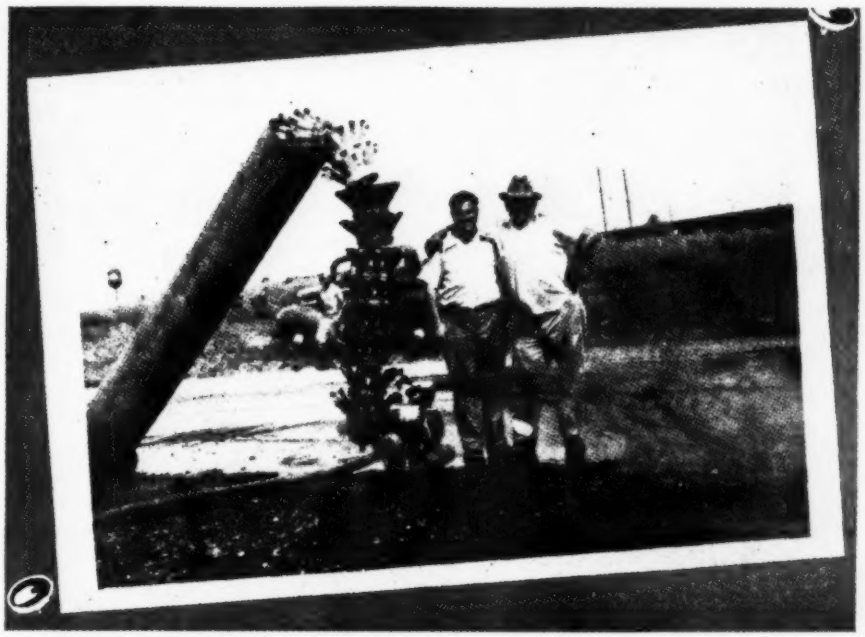
For further information on this unit enter the above key number on a Reader Service Card, and mail.

Mathieson's Chairman Dolan Dies

George W. Dolan, Chairman of the Board of Directors of the Mathieson Chemical Corp. (formerly The Mathieson Alkali Works) died on July 24 after a brief illness. A native of Cleveland and a graduate of Western Reserve University, Mr. Dolan joined the company as a salesman in 1930. Through successive advancements Mr. Dolan rose from manager of carbon dioxide sales in 1931 to the presidency of the company in 1944, and chairman of the board in April, 1948.

STOP
JOINT LEAKAGE WITH
CARSON CLAMPS
AND MECHANICAL JOINTS
Charcoal iron bolts for Cast Iron Pipe and Fittings.
Write for Prices.
Carson-Cadillac Co.
1221 PINSON ST. BIRMINGHAM, ALA.

. . . another "SNAP"—



FOR "FLEXIBLE" TOOLS AND EXPERIENCE

Another "snap" for the Album of "Flexible" Tools and Experience shows this run in the 12" water main on Jersey Avenue, New Brunswick, N. J. Work was carried through to completion in fast time, at low cost and with a minimum of inconvenience to water users. As in most "Flexible" operations, this New Brunswick job was taken on a 100 per cent contract basis. Depending, however, upon customer option, "Flexible" also contracts tools and supervision, rents tools, or makes outright tool sales for all line cleaning requirements.

Actual snap-shot shows 12" "Flexible" pressure line scraper at the end of its run. Sizes of pipe cleaned included 6", 8", 12", 16", and 20" lines.

YOUR pipe cleaning needs are important. It will pay you to check "Flexible" today on any basis — equipment, methods, cost.

FLEXIBLE UNDERGROUND PIPE CLEANING CO.
9059 Venice Blvd., Los Angeles 34, California

855 Board of Trade Bldg. Chicago 4, Ill.
401 Broadway New York 13
147 Hillside Ter. Irvington, N. J.
P. O. Box 165 Atlanta
2011 Central Ave. Memphis, Tenn.
801 E. Excelsoir Blvd., Hopkins, Minn.
29 Cerdan Ave. Roslindale 31, Mass.
P. O. Box 694 Pittsburgh
P. O. Box 447 Lancaster, Texas
41 Greenway St. Hamden, Conn.

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries
ROBERTS FILTER MANUFACTURING COMPANY • *Darby, Pa.*

Pennsalt Consolidates New York-New Jersey Office

Upon retirement of F. G. Rodenburgh, New York District Sales Manager for the Pennsylvania Salt Manufacturing Co., the company announced that the New York Sales Office was consolidating with the Paterson, N.J. sales office, located at 152 Market Street, Paterson 1. Mr. Rodenburgh has been with the company for nearly 50 years and has been District Sales Manager in the New York firm since 1936.

Charles A. McCloskey, District Sales Manager, will be in charge of the new consolidated office, which will handle Pennsalt sales in Eastern New York State, including the New York City metropolitan area, the New England States, and Northern New Jersey.

905

Precipitators

Koppers Company, Inc., Pittsburgh 19, Pa., has recently announced the effective operation of Koppers-Elex Electrostatic Precipitators for the recovery and/or removal of entrained solid or liquid particles from industrial gases.

While these precipitators may not have a large application in the field of water and sewage treatment, they may be of interest to water plants where steam boilers are still in use, and smoke is a nuisance, or in sewage treatment works where sludge is being incinerated and the smoke problem exists.

For further information enter the above key number on a Reader Service Card and mail.

Extra Handy for Chemical Solutions

OMEGA

ROTODIP FEEDERS

The eight-armed ROTODIP meters and feeds a wide range of chemical solutions — acids, ferric chloride, liquid alum, etc. Special dipper design assures accurate, uniform delivery independent of the liquid level in the meter tank. Accurate within ± 1%, the ROTODIP requires a minimum of attention . . . has no valves, pumps, or diaphragms to maintain or replace. An Omega variable speed drive permits infinite variation of the feed rate over a 100 to 1 range. Standard units feed from 1 to 800 gph; multiple units and automatic proportioning controls are available. Bulletin 46-49 on request.

OMEGA PRODUCTS

Volumetric Feeders • Gravimetric Feeders • Solution Feeders • Lime Slaking Equipment • Bucket Elevators • Laboratory Stirrers

OMEGA MACHINE COMPANY

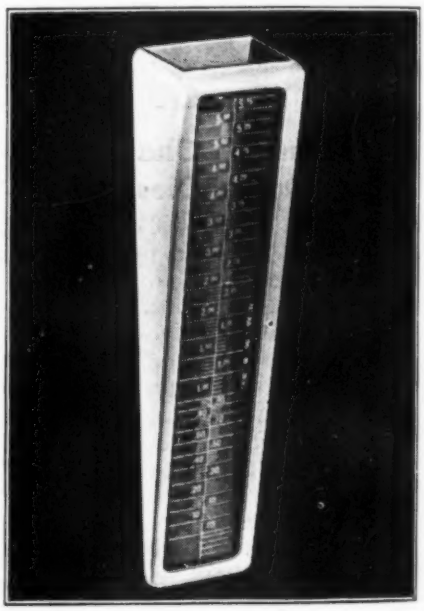
(Division of Builders Iron Foundry)

10 CODDING STREET • PROVIDENCE 1, R. I.

906

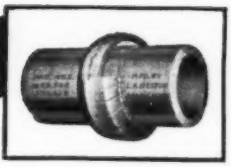
Rain Gauge

Jobs, Inc., of Albert Lea, Minn., has developed a new type of Rain Gauge. Known as the Tru-Chek Rain Gauge, this unit made from aluminum is a glass sight gauge, and is said to accurately measure rainfall from 0.1 to 6 inches. The overall length is 13 inches and the size at the top is 2½ x 2¼ inches.



Most water works men like to know how much rain fell during any particular period of the day, and practically all sewage works superintendents and operators are interested in not only the rainfall at their own plant but also throughout the entire city. With these relatively inexpensive units strategically placed throughout a city the rainfall at any particular location or any particular time may be easily determined.

If you are interested in this new style rain gauge, enter your name and the above key number on a Reader Service Card and mail to this magazine.



GASKET AND FORM

The Perfected Method for Making Sewer Pipe Joints of Cement

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON **Adams, Mass.**

Neptune Meter Has New Kansas City Office

The Neptune Meter Co. has recently moved its Kansas City office to its new building at 25 W. 15th St., North Kansas City 16, Mo. The new building will have office and warehouse facilities and will be completely equipped for testing and repairing of meters.

Turco To Have New Midwest Plant

Turco Products, Inc., at 6135 South Central Avenue, Los Angeles 1, Calif., has chosen McCook, Ill., as the site of a new, modern plant for Turco Products, Inc. The company manufactures industrial cleaning compounds. The new plant will be in addition to the present facilities in Chicago, Los Angeles and Houston. The city of McCook makes an ideal location because of its availability to various sources of raw materials and its central location for distribution.

Hazleton Type "M"

CHECK VALVE

with Built-in Mercoid Motor Shut-off Switch for Automatic Pump Protection

PROTECTS PUMP FROM DAMAGE DUE TO LOSS OF WATER

PREVENTS OPERATION OF PUMP UNTIL PROPERLY PRIMED

Flow switch insures pump against damage in event pump loses water during operation. Mercoid switch is actuated by valve-flap. Switch is connected into no-voltage coil of motor starter.

Write for Further Information

BARRETT, HAENTJENS & CO.
HAZLETON **PENNSYLVANIA**

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

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Sales Office 140 Cedar St., New York, N.Y. Factory Medford, N.J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

MACHINE BLENDED

BOND-O

A dependable self-caulking joint compound for cast iron bell and spigot water mains.

Used by hundreds of water companies—water departments and water works contractors.

NORTHROP & COMPANY, Inc.
SPRING VALLEY, NEW YORK

REPAIR and SAVE
Water Meter Measuring Chambers
with the
MEMPHIS SLOT INSERT
of stainless steel with new bronze thrust roller.
For further information and *free* 5/8" samples
address
METER SPECIALTY CO.
1332 N. Seventh St. Memphis, Tenn.

LITERATURE AND CATALOGS

907

40TH ANNIVERSARY

Gilbert Associates, Inc., has published a beautifully illustrated book on its **40 Years of Achievements.** The book contains a diagram of administration and services, as well as pictures of various types of work performed by the company.

Among other things the bulletin contains a page devoted to the application of the sanitary engineering department of the company to the field of water treatment, sewage treatment, and industrial waste treatment. Laboratory service, which is offered by the company, is also discussed.

If you desire further information on these services, enter the above key number on a Reader Service Card and mail.

K-1400 Corporation Stop. Inlet standard water works thread; outlet copper service pipe with straight coupling nut.

Glauber Quality

"PAYS OFF" WITH

YEARS OF EXTRA

SERVICE $ $ $

K-1410 Curb Stop with solid brass tee handle. Round way, inside iron pipe thread to copper service pipe.

Lifetime red brass metal, controlled precision machining and rigid inspection, plus years of experience are your warranty that Glauber fitted water lines will last longer. Designed for easy operation and in patterns for all regular installations, Glauber ground key fittings are truly your safest investment for trouble-free service. Write today for catalog and prices on your requirements.

THE Glauber BRASS MFG. CO., KINSMAN, O.
Division of H. B. SALTER MFG. CO., Marysville, Ohio

Glauber RED BRASS
GROUND-KEY, CURB and CORPORATION STOPS
LEAD GOOSENECKS and WATERWORKS FITTINGS

908

SURFACE WASH SYSTEM

The Stuart Corp., 516 N. Charles St., Baltimore 1, Md., has issued a folder on the installation use, and application of **Palmer Surface Wash System.**

To obtain a copy of this folder, enter the above key number on a Reader Service Card and mail to this magazine.

909

GRATINGS

Irving Subway Grating Co., 5009-27th St., Long Island City, N. Y., has published a catalog on **Irving Gratings.** This catalog includes pictures and diagrams of all types of Irving Subway Gratings, for use in industrial plants, water and sewage plants, and other locations.

To obtain a copy of this catalog on gratings, enter the above key number on a Reader Service Card, together with your name and address.

910

VALVE MAINTENANCE

In the No. 2 issue of the 1948 series of the **Valve World,** published by Crane Co., 836 S. Michigan Ave., Chicago 5, Ill., appears an article on "How To Maintain and Repair Gate and Globe Valves". The article is written by R. A. Hendrickson, Mgr., Oil Sales, Crane Co. It completely illustrates methods of maintaining these valves.

This issue of the Crane *Valve World* also contains an article on "How Phoenix Increases Water Supply," written by R. Gail Baker, City Engr., City of Phoenix.

If you are interested in these items, fill in a Reader Service Card and mail.

911

CONVEYORS

Hapman Conveyors, Inc., 2405 W. McNichols Rd., Detroit 21, Mich., has issued a catalog on **Rubber Flight, Sealed Pin Conveyors.** These Hapman conveyors are designed for handling any material including abrasives, and the book contains information on typical installations in industry, and shows various diagrams, and designs and layouts for use of these conveyors.

If you desire copy of this catalog, enter the above key number and your name and address on a Reader Service Card and mail.

912
PLASTIC BLOCK COMPARATOR

The LaMotte Chemical Co., Towson, Baltimore 4, Md., has issued a two-page service bulletin on the **LaMotte Plastic Block Comparator.** These items are offered for chlorine control, feed water control, electroplating control, and various other purposes.

To obtain one of these service bulletins enter your name and the above key number on a Reader Service Card and mail.

913
BRASS GOODS FOR WATER WORKS

The Red Hed Mfg. Co., 368 Congress St., Boston, Mass., has published catalog No. 12, revised, on the **Red Hed Brass Goods for Water Works.**

This catalog shows a complete stock of curb stops, cellar stops corporation cocks, copper fittings, and so forth manufactured by the company. In short, all equipment necessary for water service connections is shown in this catalog.

To obtain a copy of this catalog enter the above key number with your name and address on a Reader Service Card and mail.

914
EVERDUR METAL

The American Brass Company, Waterbury, Conn., has available a bulletin on **Everdur Metal** for sewage treatment equipment, reservoir and water works service. The bulletin describes the use of Everdur metal in sewage equipment, and in water distribution systems. Photographs are shown of various types of equipment now in use in sewage treatment plants and water works. These include traveling screens, magnetite filters, air filters, sewage fine screens, slide gates, and so forth.

A copy of this publication is available. Just mail a Reader Service Card on which you enter your name and the above key number.

915
DE-IONIZATION SYSTEM

The Dorr Co., 570 Lexington Ave., New York 22, N.Y., has just published Bulletin 4081 on the **Dorrco D-I Systems.** This 24 page publication traces the development of de-ionization (D-I) from the early use of natural green sands to the present. The book explains the development of synthetic organic resins, gives the theory of operation of ion-exchange and discusses the various Dorr D-I Systems as well as treatment costs, laboratory units, and the Dorrco Salt Acid Process.

The use of de-ionization systems for preparing distilled water has been known and practiced for some time as has been the softening of water for domestic and industrial use. A recent development is the application of these units to the removal and recovery of various metallic ions such as copper, chromium, and nickel from dilute waste solutions.

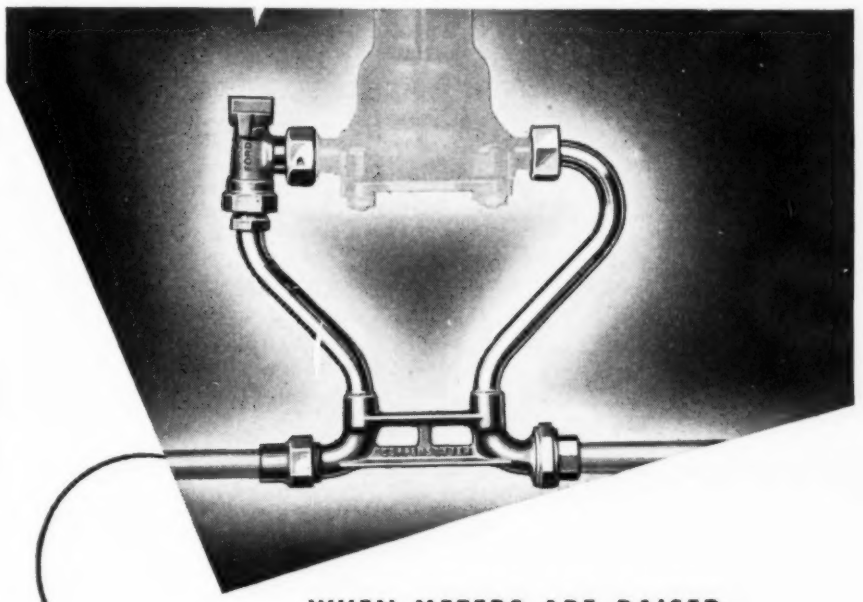
If you desire a copy of the bulletin enter your name and the above key number on a Reader Service Card and mail to this magazine.

916
WATER METERS

Pittsburgh Equitable Meter Division of the Rockwell Manufacturing Co., Pittsburgh 8, Pa., has just released a new bulletin on the **Empire Oscillating Piston Meters,** Type 14.

These Type 14 balanced piston water meters are for use in warm climates. The catalog shows the various sizes available, the parts of the meter, and gives a price list of parts.

To obtain a copy of this catalog, enter your name and the above key number on a Reader Service Card and mail.



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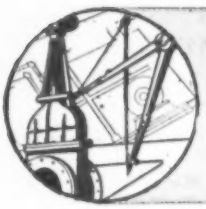

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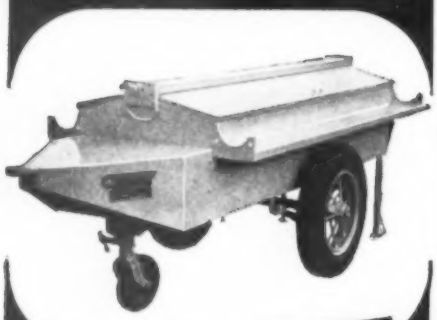

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*Advertisers with * were represented in the April, 1948, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

CHECK THESE *Dorrco Distributor* FEATURES

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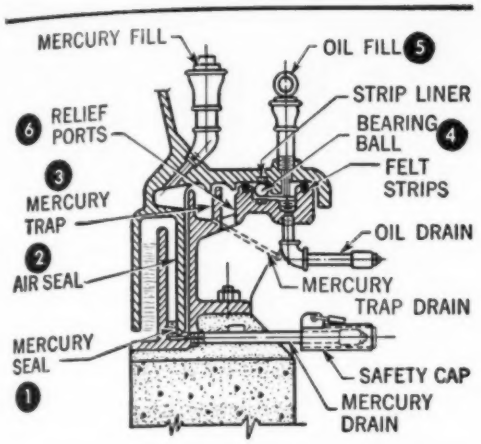

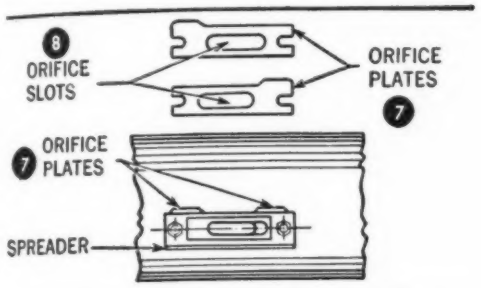

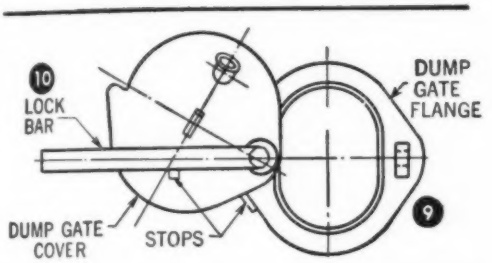

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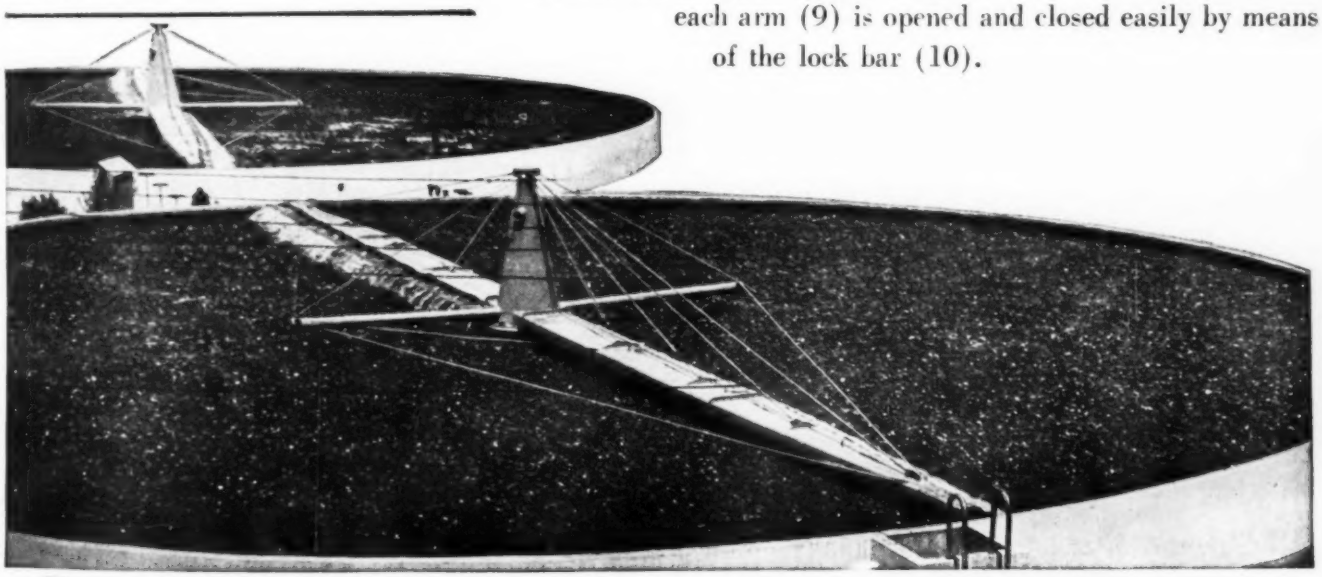

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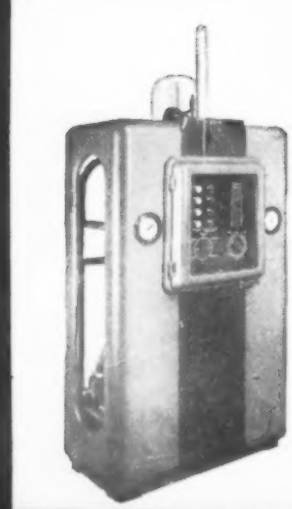

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